# Report of the Citizens Review Committee on the Connecticut River Basin Comprehensive Water and Related Land Resource Investigation

To the
New England River Basins Commission

1 FEBRUARY 1971

# REPORT OF THE CITIZENS REVIEW COMMITTEE ON THE CONNECTICUT RIVER BASIN COMPREHENSIVE WATER AND RELATED LAND RESOURCE INVESTIGATION

TO THE
NEW ENGLAND RIVER BASINS COMMISSION

February 1, 1971

ADDENDUM

Page II-4. Insert the following new first full paragraph: New power development. No new power development presently planned in the basin or contemplated by the Early Action Plan would require major new dams on the main stem or its tributaries, nor is it anticipated that any such development would significantly limit other existing or possible uses of the basin's water resources.

Page II-7. Insert the following sentence after the first line on the page: Investigation of this matter should include study of the future desirability of using part of any such surplus for low flow augmentation within the Valley and for water supply to downstream metropolitan areas in Massachusetts and Connecticut.

Page II-16. The second sentence, last paragraph, should read: For future studies CRC recommends that a citizen review committee be established at the outset or at an early stage in the study so that it may play a role in setting the study's scope; and that it receive....

Page II-17. Insert new paragraph immediately following subhead "land use controls:" Land management. Increased emphasis should be placed on the following land management measures: protection of high elevations from development; zoning against development where indicated by climate, slope, geology or exposure; wise land use practices in forest and farm; and practices to minimize dangers from erosion, pollution, and rapid runoff on land suitable for development. (3)

Page II-17. Reference to the Vermont Planning and Development Act of 1970 should read: Vermont Municipal and Regional Planning and Development Act of 1970, V. S. A. Title 24, and the Vermont Environmental Board and District Commissions Act of 1970, V. S. A. Title 3....

Page III-3. Insert the following new paragraph after the first full paragraph: The CRC is very much aware of the considerable concern that exists with respect to uncontrolled population growth and the difficulty of dealing with this problem realistically. It must be emphasized, however, that there is a strong viewpoint both within the CRC and throughout the Connecticut River Basin that there is an optimum level of population

and industrial development in the Valley beyond which environmental quality and general social well-being for the Valley's inhabitants will be seriously threatened. The immediacy of the current, and presumably temporary, economic downturn throughout the Nation should not blind us to the longer term problem.

Page III-9. Add new sentence at end of paragraph numbered 8: If necessary, it should be funded as required to engage a professional public relations consultant.

Page IV-1. Begin new paragraph with fourth sentence of second paragraph and add the following: This misunderstanding may result from the misleading inclusion of $700 million in new power development in the Plan's total implementation cost of $1.8 billion. Almost all new power development would be privately financed, and the Plan's implementation cost should instead be stated as $1.1 billion in public funds that would be necessary for carrying out the public projects recommended in the Plan. Moreover, it appears that less than half of this $700 million in new power development is presently planned within the Basin during the 1970-80 period. (This planned development consists of completion of the Northfield pumped storage project and the Vernon nuclear plant, expansion of the Middletown fossil fuel plant, and construction of a pumped storage facility at Bear Swamp on the Deerfield River.) The remainder of the additional power needed in the Basin by 1980 is likely to be provided by facilities elsewhere in New England. No new power development presently planned in the Basin or contemplated by the Early Action Plan would require major new dams on the main stem or its tributaries, nor is it anticipated that any such development would significantly limit other existing or possible uses of the Basin's water resources. Indeed, as far as the Early Action Plan is concerned, it appears that power uses would be constrained more than they would be facilitated by implementation of the Plan in that the Plan's recommendations for re-regulation of flows for low flow augmentation purposes would cut noticeably into existing hydro power output in the Basin.

Page V-5. Insert the following sentence after "Boston MDC area," middle of the first paragraph: Investigation of this matter should include study of the future desirability of using part of any such surplus for low flow augmentation within the Valley and for water supply to downstream metropolitan areas in Massachusetts and Connecticut.

Page AI-4. The last sentence of the first paragraph should continue: and certainly so with respect to the information presented by concerned scientists.

Page AI-5. Insert the following before the next to last sentence and begin a new paragraph: The experience was unquestionably valuable both for the citizens involved and for the agencies engaged in plan development.

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## INTRODUCTION

The Connecticut River Basin Citizens Review Committee (CRC) was organized by the New England River Basins Commission (NERBC) at the suggestion of Congressman Silvio Conte, of Pittsfield, Massachusetts, to participate in a review of the Coordinating Committee report, the Connecticut River Basin Comprehensive Water and Related Land Resources Investigation.

As prescribed by the Water Resources Planning Act of 1965 and the Water Resources Council, the Coordinating Committee report has been submitted to NERBC for review and comment by NERBC, by the heads of affected federal agencies, by the governors of the four basin states of Connecticut, Massachusetts, New Hampshire and Vermont, and by the International Joint Commission.

The Water Resources Council established November 1, 1970 - February 1, 1971, as the 90-day period for comment by the federal agencies and states, in accordance with the act. The deadline for NERBC's transmittal of the Coordinating Committee report to the Water Resources Council, together with its own and the received comments, was set at May 1, 1971. CRC's review was made concurrent with the reviews of the federal agencies and states commenting to NERBC in order to permit NERBC time in which to take CRC's findings and recommendations into consideration in conducting its review.

CRC's report will accompany the Coordinating Committee report and all other reviews provided for by the act to the Water Resources Council, to the President and to the Congress. In addition, NERBC will transmit copies to the governors and legislatures of the four basin states and arrange for general public distribution. Arrangements have been made for public presentation of the report to NERBC, at a special meeting of NERBC, February 9, 1971, at the University of Massachusetts Memorial Hall, Amherst.

The assignment given to CRC was to evaluate the findings and recommendations of the Coordinating Committee report, taking into consideration the expressed needs and preferences of basin communities, individuals and organizations within a regional, basinwide context. Views on individual projects were requested, particularly in cases where controversy was found to

exist. However, the analysis was not limited to local concerns; CRC was invited to - and did - comment on the report taken as a whole, with respect to needs at every resource management level in both the public and private sectors.

Members of CRC were appointed by the Chairman of NERBC, Frank Gregg, from nominees submitted by the basin state members of NERBC. The selection of nominees and members was principally intended to achieve a basinwide balance of views concerning the recommendations of the Coordinating Committee report. Additional representation of urban and other geographic concerns was provided at CRC's request following its organizational meeting October 23.

CRC organized for the performance of its work into six subcommittees. CRC's final report to NERBC presents the findings and recommendations of these subcommittees, together with dissenting views and appendices.

Subcommittee organization roughly paralleled the organization of the Coordinating Committee report. Study elements involving similar or related considerations were combined for ease of analysis into the following groupings:

assumptions, planning principles and criteria;

power;

water supply, water quality, flood control and commercial navigation;

recreation, fish and wildlife and site preservation;

upstream water and related land resource potential; and

implementation.

Chairmen were designated and their assignments made at the November 12 CRC meeting.

CRC held four full committee meetings, each at the University of Massachusetts, Amherst, on October 23, November 12 and December 15, 1970, and on January 14, 1971. CRC meetings were open to the public. A symposium of concerned scientists was arranged prior to the December 15 meeting to which CRC members were invited; papers presented at the symposium are appended to the report. CRC held a special meeting January 11 for discussion of its preliminary findings and recommendations with the Coordinating Committee, also at Amherst. The minutes of CRC meetings are appended.

Subcommittee meetings were held in various parts of the basin. The views of concerned individuals and organizations and affected communities throughout the basin were sought. Additional documentation on the Coordinating Committee report and related matters was furnished to CRC by NERBC and the Coordinating Committee on request.

Valley news editors were regularly notified in advance of each committee meeting, and received press releases informing them of the results of each meeting. Issues raised after the first month of the review were clarified in a background information statement prepared by NERBC and distributed to Valley news editors. A need arose particularly to clarify the role of the Coordinating Committee report in the process of authorizing and funding resource management programs and projects in the basin. It was explained that the report is intended for use as a guide, and that neither it nor the review comments would in any way constitute binding ratification - or rejection - of project proposals that otherwise remain subject to normal procedures for authorization and funding.

Public comment on the Coordinating Committee report and its review reflected additional uncertainty whether opportunities for further citizens' reviews and expert evaluation of study proposals were precluded by completion of CRC's report. It was explained that three months' additonal time remains for comments to NERBC before transmittal of its review to the Water Resources Council; afterward the opportunities that remain are those customarily provided for in project authorization and funding procedures at the federal, state and local levels.

The participation of a group of lay citizens in an inter-agency review process prescribed by federal statute is probably unprecedented in resource management in the United States, and its implications are accordingly hard to define. What has emerged from the CRC review is a thoughtful analysis of a landmark study, reflecting a range of concerns whose level of expression in the planning process had heretofore not equaled their importance. An important step has been taken toward the organization and implementation of a more effective, representative resource management process in the Connecticut River Basin.

David C. Harrison
NERBC Staff Assistant to CRC

Boston
February 1, 1971

ABSTRACT

1. The presentation of data on alternative systems of flood control is inadequate to provide CRC a satisfactory basis for judgment on acceptability of the proposals for flood storage. A desirable presentation would include data on the economic impairments associated with various levels of flood flows, and the costs of realistic flood plain management programs incorporated in an overall flood control program.

2. Prudence requires that land areas which will be utilized in the long-term comprehensive development plan be acquired as soon as possible. These areas should be developed immediately for recreational and other socially desirable purposes. The land to be acquired should include the undeveloped flood plains and candidate sites for future impoundments, including those impoundments whose approval remains uncertain at this time.

3. Studies to determine the ecologic impact of proposed structures and land development plans should be undertaken as soon as possible. A first step in this undertaking should be the delineation of guidelines for ecologic studies that are (a) scientifically sound and (b) promise to provide useful results within a reasonable time. A methodology that is open-ended in terms of terminal period is of little use as an aid to decision-making.

4. The highest priority should be attached to the development of essential waste treatment systems. The implementation of State plans for water pollution control should be carried through vigorously. CRC recommends that, in addition, studies be undertaken to determine how current State plans should be updated so that the quality of receiving waters will be maintained and improved despite the increasing pollutional stresses of the future.

5. The Citizens Review Committee recommends that a minimum flow of 0.2 cfs per square mile of drainage area be maintained in the main stem of the Connecticut River and its tributaries. Departures from this requirement should be approved only in exceptional cases and then only after careful study.

6. The Citizens Review Committee recommends that in future planning undertakings, a Citizens Advisory Committee be established at the outset or very early in the planning stage, so that it may play a role in determining the objectives to be attained and the scope of the comprehensive program.

# SUMMARY OF FINDINGS AND RECOMMENDATIONS

Key to cross-referencing:

(1) Report of the Subcommittee on Assumptions, Planning Principles and Criteria

(2) Report of the Subcommittee on Power

(3) Report of the Subcommittee on Water Supply, Water Quality, Flood Control and Commercial Navigation

(4) Report of the Subcommittee on Recreation, Fish and Wildlife and Site Preservation

(5) Report of the Subcommittee on Upstream Water and Related Land Resource Potential

(6) Report of the Subcommittee on Implementation

## ASSUMPTIONS

Availability of water for economic development. Until such time as an optimal population level can be determined for a given region, and "natural" population concentrations continue, under- and unemployment are societal pollutants that demand at least as high a priority of consideration as the de-pollution of the environment. Projects contributing to economic development must be given full consideration. (1)

Continuation of present employment levels. In CRB V unemployment and underemployment are high, and conditons are worse than a year ago. This is suggested as a powerful consideration in rejecting any irresponsible addition to the procedural delays already inherent in the implementation process. (1)

Continuation of relative domestic and national defense needs. CRC recommends even greater increases in federal allocations for environmental research, development and control, and the identification of outlay on environmental quality as a separate budgetary function. (1)

## PLANNING PRINCIPLES AND CRITERIA

Consideration of alternatives. What is presented is a plan, not alternative plans to which each of the criteria of national efficiency, regional development, and environmental quality can be applied. (3)

Economic orientation. The study, prepared under the direction of Senate Document 97, modified to some extent by the Water Resources Planning Act of 1965, resulted in three declared objectives of national efficiency, regional efficiency and environmental quality, but with a heavy economic orientation. (1) (3) The recommendations of the Coordinating Committee enhance the potential for regional development with a pronounced orientation toward economic criteria. (1)

Structural vs non-structural solutions. There seems a preference for structural over non-structural solutions. This no doubt stems from long-standing institutional concerns, from lack of economic analysis techniques which take into account unmeasurable or intangible values, and from judgments as to political feasibility. (3)

Consideration of social costs and benefits. At the beginning of the study, cost/benefit analysis tended to ignore knotty questions of social costs and benefits. Until ways are developed for taking into account intangible values, social costs and benefits, and direct but perhaps longer term or less evident impacts, it will be difficult to gain a true estimate of the worth of any proposed program. (3)

Consideration of environmental quality. The study does not give adequate weight to the environmental quality objective. An absolute necessity is significant studies on the ecological impact of various alternatives before the commencement of new projects. Before good decisions can be made consistent with environmental quality objectives, questionable programs which are very costly or whose results are irreversible should be delayed pending further investigations. (3)

Weighting the new criteria. The supreme difficulty is determining at what point the legitimate rights of local residential groups become selfish interests detrimental to the larger region. CRC recommends research and development, on a national scale, of an effective methodology for weighting the four planning criteria proposed by the Special Task Force report to the Water Resources Council (July, 1970), namely: national economic development; quality of the environment; social well-being; and regional development. An established weighting methodology would permit regional characteristics to develop as a reflection of each region's unique heritage and traditions, that yet would clearly delineate the rights of the larger polity as against the rights of the smaller polity. It could be used as the basis for determining optimal levels of population, economic activity, social well-being and environmental quality of a given region. (1)

## POWER

General recommendation. CRC is generally in agreement with the findings of the report on electric power (Appendix I) prepared by the Federal Power Commission. (2)

Inclusion of $700 million power cost in cost of Early Action Plan. CRC strongly questions the inclusion of the $700 million indicated for power facilities in the $1.8 billion pricing of the Early Action Plan. Financing of electric facilities is more than 90 percent in

the private sector. Inclusion of this large sum tends to cloud the public's focus on the problem of allocating scarce tax dollars to high priority items. (2)

Minimum release flows. The Coordinating Committee requirement that four power plants on the main stem - Wilder, Bellows Falls, Vernon, and Turners Falls - release 0.2 cubic feet per second per square mile of drainage area (abbreviated as csm) as a condition to relicensing will decrease power output and will add to the increase in power costs to the consumer. The other benefits far exceed the cost, in terms of water quality, recreation and fish and wildlife enhancement, and compliance with the minimum release flow should be made a prerequisite for relicensing of these dams. CRC would recommend means of requiring power plants not up for relicensing to comply. Early study should be given to the application of the 0.2csm requirement to other main stem power dams and to the question of what requirements should apply to the dams on the tributaries. There should be appropriate monitoring of the river flow to assure compliance and a means developed to evaluate the effectiveness of the measures. (2)(3) (4)

Controls over power supply and demand. Aside from the dubious proposition that price manipulation be used to choke off public demand for a desired commodity, it is quite likely that changes in actual cost relationships in the electrical field will tend to exert increasing pressure against any excessive use of electricity. Extraordinary increases in the cost of construction, cost of money, cost of environmental accommodation and cost of fuel may well double the cost of generating electricity. Because generating costs unlike distribution costs attach with substantial equality to each kilowatt hour sold, a rise in the former will result in imposing the highest percentage rate increases on the bigger, low-rate users. Thus, working of normal cost-price constraints should make unnecessary any contrived use-dampeners. Moreover, overt efforts to discourage power production by way of the market mechanism may increase the demand for other forms of energy which may have an equal or greater effect on the environment. (2)

In-basin power production. The Connecticut River Basin is expected to change from an exporter to an importer of power. It appears that the trend is toward a regional bulk power supply economically viable for the area comprising the six New England states. The basin should not be independent with regard to power production and consumption; it must be considered as an integral

part of the whole New England region. (2)

Industry's environmental awareness. CRC endorses the current approach of the power industry in reduction of promotional procedures and increased efforts for production with concern for environmental impact, and recommends expanded exploration of the effects of power production to provide the optimum balance of technological and ecological factors. (2)

Environmental impact evaluations. Environmental impact statements are now required by governmental agencies and it is recommended that these be expanded to include private agencies. Increased awareness of ecological problems should be a major factor in planning and design of electrical power projects. (2)

Preconstruction permits. Power plant licensing restrictions should be made uniform and preconstruction permits should be required by each state before construction. (2)

## WATER QUALITY

Priority and classification of water quality. CRC strongly endorses the high priority given in the study to improvement of water quality throughout the Connecticut River Basin. There is unanimous agreement that the eventual goal should be a classification of no lower than "B" quality for the whole river system, including the tributary basins. CRC urges continuous and coordinated state efforts toward this end, and adequate federal funding. (3)

Sewage treatment plant construction. CRC recommends that top priority be given in the allocation of available public investment funds for sewage treatment plant construction to meet approved state water quality standards. (3) (4)

Low flow augmentation. There is complete agreement with the study that augmentation of flow should not be considered a substitute for treatment of all wastes to at least the secondary level before discharge into the river. CRC further agrees that the role of low flow augmentation should be studied only after the implementation of planned treatment facilities, analysis of their performance, and evaluation of new waste treatment technologies. If low flow augmentation is found to be the only answer to a particular or localized problem, CRC prefers solutions especially designed to that specific problem. CRC recommends that high priority be given to further research before action of the needs for and

ecological impacts of low flow augmentation. (3)

Recycling of wastes. In the long run, advanced waste treatment processes may be required if a "B" quality is to be attained or maintained in receiving waters. Several promising new recovery techniques should be evaluated, especially means of recovering agricultural run-off and recycling of domestic sewage. (3)

Study of pollution problems. CRC strongly supports the recommendations for further detailed study of certain pollution problems particularly those associated with industrial wastes, phosphates and nitrates, mercury, pesticides, water borne viruses, sludge accumulations and nuclear or thermal discharges. (3)

Continuing re-evaluation of standards and plans. CRC strongly endorses the proposal for a Connecticut River Basin program in the New England River Basins Commission for the purpose of providing for continuous re-evaluation of both standards and implementation plans. (3)

Additional research needs. CRC agrees with the study's recommended research on streamflow and sediment rate measurements under different land uses and topographic and soil conditons, and on multiple uses of municipal watersheds and their effect on water quality. (5)

WATER SUPPLY

Controlled diversion of water supply. The concept of controlled diversion of truly surplus waters is reasonable, and CRC supports the sharing of such waters from the Connecticut River as proposed in the Northfield Mountain pump storage project. However, this is conditional upon recognition of the riparian rights of the Valley's communities, industries and individuals, and the right of return of these waters at such future time as they may be needed for water supply. (3)

Definition of "excess" flow. The availability of water and the demands for future water supply in the Connecticut River Valley have not been fully studied or planned for. CRC is concerned over statements by responsible state and federal agencies that there exists a substantial surplus of water in the Connecticut River Valley that will not be needed for Valley use, and that such

waters should be diverted specifically to the Boston MDC area. In depth exploration is needed of the ecological, social and economic measurements used in determining "excess flows." (3)

Mechanism for allocating water. Diversion of water should be conditioned upon: a regional mechanism for allocation of water; proper monitoring of diversion volumes and reporting to an independent authority such as the NERBC; also the possibility of establishing a quid pro quo such as expanding recreation on Quabbin reservoir in return for that reservoir's receiving surplus Connecticut River waters. (3)

Independent regional evaluation. CRC recommends that various systems for diverting Valley riparian waters currently being investigated be referred to an independent regional group such as the NERBC for further consideration. (3)

Determination of groundwater supplies. CRC recommends acceleration of the program for determining location and available yield of groundwater sources in the Basin and for protecting these sources as defined. (3)

## FLOOD CONTROL

### Measurement of Need for Flood Control Structures

Acceptable level of risk. The study report does not clearly explain the risks involved which substantiate the need for a new system of large multi-purpose or flood control dams. The report is not clear on the probabilities of major storms, their impact if they occur, nor the costs of varying degrees or modes of protection. To make any reasoned judgment, or to set priorities, calls for some understanding of the probabilities of occurrence of various flood discharges and the probable damages associated with each. The development of a Standard Project Flood, which is a hypothetical flood that has never been known to occur, is a difficult concept. The necessary assumptions involved make estimates of risk or probability of occurence even more tenuous. The study report does not adequately explain why or which new large flood control impoundments are essential, what alternative measures are feasible, and what sacrifices may be required in terms of environmental quality and personal income. "Flood control" is an often misunderstood and perhaps illusory concept. What is actually involved is a modicum of flood protection or flood damage prevention. And such protection is never complete. There is always some risk. The real question then becomes one of level of protection desired or degree of risk that one is willing to accept. This is a matter of judgment and choice. (3)

Evaluation of Alternative Measures

NERBC evaluate alternatives. The need for increased protection for existing urban centers requires clarification at the earliest possible date. As a matter of immediate priority, NERBC should institute a study of need for new large flood control impoundments, alternative degrees of flood protection for these centers, and long term costs and benefits of alternative means of providing such protection. CRC urges NERBC to secure adequate funding to carry out ongoing studies and public discussion to determine the need for alternative measures for flood protection. If this NERBC study and review process can not be completed by July 1, 1973, specific steps should be taken to preserve the major options under consideration until such time as a final choice of alternatives has been made. Such steps might include: (1) the preservation of opportunities for raising or extending local protection works and (2) the reservation or acquisition of important impoundment sites for future flood control, recreation, or open space purposes pending further study. (1) (3)

Control of 25 percent of drainage area. The study states that flood control protection for the lower basin calls for control of 25 percent of the drainage area above Hartford, Connecticut, and that only 19 percent coverage is considered provided by projects to date. Precisely what these figures mean or include is not clear in the report. Nor does CRC find this objective adequately delineated to serve as a criterion against which specific alternatives may be measured. (3)

Relative need versus other investments. There seems to be an implicit assumption in the study that a favorable benefit/cost ratio is a measure of the relative desirability of a flood control project. There needs to be more specific consideration of the relative values of the flood control proposals against other possible investments, especially those in the water resources field. (3)

Relative need versus different approaches. The study mainly makes the comparison of constructing a flood control facility or not constructing it, or constructing a number of smaller structures and/or local protection devices. CRC questions whether serious consideration has been given to measures such as flood plain regulation or the removal of encroachments from hazardous locations. (3)

Recommended alternative solutions. CRC recommends that existing protective works be modified to increase protection where necessary and that new protective works be built only if absolutely necessary, all above solutions being considered inadequate. CRC recommends that in some instances where existing dams can be modified to provide larger reservoirs for flood protection, these alternatives be considered in preference to construction of new impoundment structures. (3)

Measurement of Project Benefits

Land development. Flood protection is assumed to be primarily a federal rather than a local responsibility. There has been no presumption of a concomitant federal responsibility to restrict flood plain development. For federal flood control projects, little or no local cost sharing is required. This is in effect a subsidy, an increase in value to individuals and local communities because the federal government seemingly underwrites risks of flooding at little or no cost to the beneficiaries. The result is that the federal government is subsidizing and encouraging flood plain development. As long as there is federal subsidy without local responsibility, there is likely to be no adequate measure of value of projects. If flood control proposals are intended as land development measures, then there should be procedures for weighing the benefits of flood control programs against benefits of other possible land development programs. CRC fears that "flood control" as now practiced, without effective flood plain management, tends to be self-perpetuating and self-expanding. (3)

Compatibility of multiple uses. The justification of multi-purpose dams depends upon the collective benefits of purposes which may not be completely compatible. Flood control, water supply, flow augmentation and recreation within a simple reservoir are all competing and probably in the long run mutually exclusive uses. (3) (5)

Measurement of Project Costs

Opportunities lost. There seems a need for additional economic and social data on the effects of dams on the local areas where they are to be located. Opportunities lost, such as stream fishing, hunting, etc. should be considered as part of the overall "costs" of the project if they are to be replaced. (3)

Maintenance of stream channels. Flood control programs which regulate discharge rates and flow of sediment will have effects on the stream channel. Proposals should include anticipated changes in stream channels and estimates of possible required expenditures to overcome problems created. CRC recommends also that research be undertaken on reservoir sedimentation rates and their long term consequences. The estimated life expectancy of water impoundments should be known. (3) (5)

Specific Projects

Meadow/Gaysville/Victory reservoirs. CRC recommends that any decision concerning the Meadow, Gaysville and Victory dam projects be held in abeyance until the priorities and recommendations stated in CRC's report, for flood plain management, zoning, land acquisition and appropriate alternatives for flood control have been implemented. Concurrent studies should also be undertaken to determine if there is a continuing need for the projects in the light of all appropriate alternatives. (3)

Bethlehem Junction reservoir. It is recommended that planning continue on the Bethlehem Junction project, provided there is a local citizens advisory committee established which could be brought in to advise on all aspects of the project. (3)

Claremont/Honey Hill reservoirs. CRC recommends that because the case for these two projects is not yet clear, they be restudied for alternative solutions. (3)

Beaver Brook reservoir. Local response in Keene seems enthusiastic for this project. The area faces a long range water supply problem. The project is also considered to have good conservation features. Unless more facts are forthcoming, CRC recommends completion of the Beaver Brook dam. (3)

Tully reservoir. The area of greatest concern is the quantitative impact of the proposed flood skimming on the various streams involved. Presumably the environmental and social impact would be substantial. CRC recommends that an in-depth study be made as to the ecological, social and economic effects on the area of the diversion of excess flows before further action is taken on the proposed modification of the Tully reservoir. (3)

Gardner reservoir. According to the Coordinating Committee report, the Gardner site is being retained as an alternate proposal to advanced treatment methods. CRC recommends that all steps for pollution control be given priority before the dam. (3)

Small Watershed projects. There is considerable concern over the justification and possible ecological impacts of numerous small impoundment projects. CRC is not clear on how the small watershed programs fit into the overall flood control objectives and program for the entire basin. It is recommended that the small watershed programs be scrutinized for integration into overall flood control plans, and that action be delayed until more information is available on how and by whom these projects would be constructed and on their ecological impacts. (3) (5)

## Flood Plain Management

Flood plain development. CRC cannot approve the building of flood control reservoirs at the expense of natural lands and waterways in the upper basin as long as the same old development patterns are being allowed in flood prone lands downstream. The creation of additional dams may actually encourage flood plain development by removing the apparent danger of loss by flooding. (3)

Effective flood plain management. CRC members strongly agree that any rational basin plan must provide for effective flood plain management as an integral part of the plan and any construction of dams large or small should be based on their need with reference to and in conjunction with accomplished flood plain zoning. CRC recommends that active programs of flood plain management be undertaken with all possible haste in all areas of the Valley where there exists the possibility of flood damage and/or expansion. (3)

Flood plain acquisition. CRC recommends that the federal, state and local governments undertake at once a program for the acquisition of key lands on the flood plains to safeguard their storage capacities and to provide recreation and open space areas near metropolitan centers. Federal law should be amended to permit the use of federal funds for acquisition of flood plains where necessary protection by zoning and encroachment lines would exceed constitutional limitations and also where intensive development pressures could be mitigated. (3) (4)

Flood plain zoning. Flood plains should be protected by appropriate combinations of state-established zoning and encroachment lines, especially along the 200 miles of the main stem from Saybrook to White River Junction. Such protective actions by the states should be a condition to the further expenditure of federal funds for major flood control impoundments. (3) (4) (5)

Flood plain mapping. State-wide flood channel regulation seems a minimum requirement. Implementation of such a program requires detailed flood plain mapping, resource inventories and soil surveys and interpretations. This kind of basic resource information would be the foundation for planning and zoning throughout the basin. CRC urges that the recommended modifications in law and increased funding be adopted to permit the acceleration of programs and their extension to urban areas. Congress should specifically provide adequate funding for both Corps of Engineers and Soil Conservation Service programs to do these studies. (3) (5)

Wetlands protection. The protection and preservation of inland swamps and bogs and estuary saltmarshes deserves more attention in the plan. (5)

Flood plain restoration. Restoration programs should be developed for urban flood plains. In some cases it will be preferable to remove existing encroachments where serious danger to life is involved or damages are predictable. (3) (5)

Federal policy. Present federal policy calls for implementation of state and/or local regulation of flood plain encroachments as a condition for private flood insurance and for construction of federal or federally-assisted flood control projects. However, present federal practice accepts "promises" of future action. CRC recommends that the requirement of "prior" implementation be held firm. (3)

## COMMERCIAL NAVIGATION

Channel widening. CRC recommends no further widening or dredging of the commercial channel to Hartford, Connecticut, until a realistic assessment is made of the costs of the project in terms of damage to estuarine life and of environmental quality objectives in general. (3)

## RECREATION

National Recreation Area. CRC recommends full implementation of the National Recreation Area proposal by a combination of federal, state and local action as recommended by the Coordinating Committee, and the appointment of an officially established advisory committee for the COOS unit, similar to ones existing in Massachusetts and Connecticut. (4)

Recognition of recreational values. The recreational values that can and should be realized in the basin go well beyond those recognized by the plan, as do the range of development activities underway and proposals under study in the basin, especially on the state and local levels. CRC believes the plan should be expanded considerably in proposals for recreational development. (4)

Urban recreation needs. The investigation has given only passing comment to urban recreation needs, without even dealing with the improvement of urban water bodies, and it fails to give important impetus to some existing and emerging proposals for development of new recreation facilities in or near the metropolitan areas of the lower basin. The Early Action Plan should be expanded with regard to opportunities for increased recreation use of the water and shores of the main stem and other existing water bodies within the urban centers of the lower basin. (4)

Evaluation of flood control recreational benefits. CRC recognizes the definite recreation values that can be achieved in connection with major flood control impoundments, although it is not in a position to evaluate the overall arguments for and against such impoundments. No values for cost/benefit assessment seem to have been given to such activities as hiking, bird watching, nature study as well as other possible recreational activities related to esthetics and the environment. (4)

Public access. CRC recommends increased public access to public water bodies as necessary to provide water-related recreation areas. In addition to acquisition of undeveloped areas for this purpose, efforts should be made to acquire the sites of old mills and other industrial buildings being abandoned at often scenic and centrally located spots along streams. Further opportunities should be pursued across power company lands. (4)

Recreational use of water supply reservoirs. CRC recommends possible increased recreational use (such as shore fishing, hiking and nature study) of some secondary water supply reservoirs and lands. (4)

## FISH AND WILDLIFE

General recommendation. CRC is pleased with the careful consideration given to the anadromous fisheries and resident fish and wildlife matters in the investigation, and the recommendations concerning them in the Early Action Plan. CRC agrees with recommendations concerning priority research needs, especially in regard to determining the effects of water impoundments on fish and wildlife habitat. (4) (5)

Fish ladders. Fish ladders or other devices should be installed where necessary at Holyoke, Turners Falls, Vernon, Bellows Falls, Wilder and Rainbow dams, either as a condition attached in pending relicensing proceedings or in other ways where no such proceeding is likely in the Early Action period. (4)

## UPSTREAM WATER AND RELATED LAND RESOURCE POTENTIAL

General recommendation. CRC's collective propensity for environmental quality leads it to a generally favorable view of the programs presented by the United States Department of Agriculture for "Upstream Water and Related Land Resources." (5)

Research and education. CRC strongly believes that implementation of the basin plan depends on developing widespread understanding and knowledge about our water and land resources. USDA has recommended accelerated efforts in conservation education at all educational levels by its agencies. Public and private agencies concerned with various aspects of conservation and resource management should also accelerate their education programs. (5)

Preservation of open farm land. Land use projections predict that crop land will decrease from 9 to 2 percent and pasture land from 4 to 1 percent by 2020. These lands represent a high percentage of lower slope and valley areas. Their loss as "open land" could have devastating effects on the esthetics of the basin. Emphasis should be placed on developing programs to maintain and preserve the "open land" and esthetic character of abandoned farm land, such as rotational cutting of forests, the introduction of wildlife cover and feed areas and the addition of such lands to the public domain. (5)

## IMPLEMENTATION

### Organization for implementation

Workable implementation mechanism. In the highest priority area is a workable implementation mechanism to coordinate programs, to continuously plan and evaluate projects, to foster and conduct research, and to make recommendations on priorities. (3)

Implementation with existing governmental machinery. Actual implementation of the plans, programs and projects delineated in the study report will be dependent upon current governmental machinery under existing federal, state and local statutes and regulations. Even though current implementation processes are laborious, time consuming and expensive, nevertheless they do afford numerous checks and balances, they are reasonably well understood and are generally acceptable as part of the price to be paid for maintaining our treasured democratic processes. (6)

NERBC role. NERBC is authorized and directed by law to do the job of coordination and planning in water resources that long has been sought for New England. NERBC should be authorized and adequately funded to continue with such immediate on-going action as is recommended by CRC, for example, to respond effectively to changed environmental legislation existing at the time of the implementation of any coordinating committee proposal and to meet the requirements of concerned government agencies. It is especially important that priority be given to further evaluation of flood risks and protective measures, to the ecological aspects of major proposed changes in existing water and related land resource conditions in the basin, to expanded monitoring of water conditons, to the maintenance and improvement of analytical models - both physical and econonometric - and to numerous other matters covered in the study report. (1) (6)

NERBC Connecticut River Basin Program. CRC endorses Coordinating Committee recommendation 5 (page XIV of the Main Report) for the establishment of a Connecticut River Basin Program (CRBP) within NERBC. CRBP is endorsed as part of an existing federal-state agency, namely NERBC, therby requiring no new enabling legislation. (1) (5) (6)

Citizens Participation

CRBP Citizens Advisory Board. CRBP incorporates an essential element for acceptance by the public in the establishment of a Citizens Advisory Board (CAB). Such an advisory board will insure citizen participation and support of plans that will reflect public needs and desires and will assist in resolving those parts of the comprehensive plan that are currently controversial. (6)

CAB membership. CAB should be large enough to provide reasonable representation of geographic areas and of the major groups concerned with the basin's resources. In this connection, the two members per state suggested for CAB in the Connecticut River report appears to be inadequate. (1)

CRBP education/information function. CRC suggests that one of the primary tasks of CRBP be education and information. CRC recommends that CRBP be adequately funded to undertake the responsibility of being the prime source of information available to the public. (1) (5) (6).

Citizens reviews of future studies. Effective citizen participation cannot be achieved by presenting a group of citizens with a completed plan without prior consultation. For future studies CRC recommends that a citizen review committee be established at an early stage in the study and that it receive progress reports as they become available for review and comment; that each progress report contain an element responding specifically to the citizen review comments elicited by the preceding report; that river basin studies be released as a series of periodic technical progress reports; that the assumptions, implications and interrelationships between every element of the report be made explicit; that a continuous dialogue be maintained between the citizen review committee and the coordinating committee undertaking the study; and that the final comprehensive report be completed within

three years. (1)

CRBP funding. CRC expresses its special concern that NERBC seek really adequate financial resources for CRBP. However, should there arise any material delays in establishing and funding CRBP, NERBC itself must forthwith engage in the performance of the functions of coordinating, planning and scheduling water and related land resource matters in the basin, as it is legally required to perform for New England's river basins. (6)

Land use controls

State legislation. The Connecticut River Basin is vulnerable to damaging land uses that will have long range deteriorating effects upon the area. It is recommended that each state take prompt legislative action to provide protection against such abuses and to assist municipalities in insuring such protection. For example, the Vermont Planning and Development Act of 1970 strengthens existing municipal zoning and subdivision regulations and provides methods for unzoned municipalities to easily adopt a prepared two-year interim zoning regulation. (6)

Site acquisition. The time lag between the initiation of the study and the implementation of any one project is in the order of eight to ten years. The nation cannot afford to lose any potential sites to incompatible development. It becomes a matter of considerable urgency that potential water impoundment sites be identified and a "freeze" be placed on such sites, with a total prohibition of any development that could inhibit future implementation of river basin study proposals. With the prospect of an ever-increasing population and the attendant pressures on land resources, sites for a variety of purposes should be acquired as rapidly as possible. (1) (3) (5)

Implementation of Coordinating Committee Report

A provisional framework. The study should be treated as a provisional framework and data base within which reasoned arguments for and against specific proposals may be set forth. CRC agrees with recommendation 1 of the Coordinating Committee report (page XIII of the Main Report) that the basin plan should be accepted and used as a guide for the development and beneficial use of the water and related land resources of the Connecticut River Basin. (1) (3)

Endorsement of governmental agencies. CRC agrees with recommendation 2 of the Coordinating Committee report (page XIII of the Main Report) that the 1980 (Early Action) Plan for development should be implemented through appropriate agencies and established procedures pertaining to both authorization and funding, subject to the reservation that projects and programs in the 1980 plan must carry the specific endorsement of legally concerned governmental agencies, including the states. (1)

# REPORT OF THE SUBCOMMITTEE ON ASSUMPTIONS

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Richard M. Brett
Mrs. Bernard H. Flood
Victor N. Gagnon
George R. Higgins
Day Lee
Thomas J. Rouner
Peter M. Stern

The preliminary selection of two factors limiting the potential value of the citizen review process-- a 90-day review period at the end of a six year study, and a delayed availability of the full nine-volume report-- remain valid.

But further issues are now clearer. Among these are that at least eleven organizations represented on the NERBC are preparing reviews and comments concurrently with the CRC. Functional and technical conflicts and inconsistencies between each and every element of the CRBS that would presumably be clearly expressed by these agencies are not available to the CRC. The constraint of time; of delayed technical documentation; of the lack of availability of the technical reviews of each element by concerned organizations, and the general lack of professional expertise among the members of the committee as a whole make it obvious that the CRC input into the Connecticut River Basin Study is not intended to be a technically expert evaluation. Nor, in the light of further reviews at higher levels, can it be intended to provide a mandate for implementation.

It is equally obvious that the establishment of the Citizens Review Committee is a bold first step towards fulfillment of the concept of citizen participation. One of its most constructive objectives should therefore be directed to the more effective fulfillment of that role, both in terms of the current Connecticut River Basin Study, and in terms of future river basin studies.

Clearly, effective citizen participation cannot be achieved by presenting a public group of citizens with a completed plan without prior consultation. For future studies the recommendations of the subcommittee suggested in preliminary reports are repeated (with slight modifications) for convenience:

(a) A Citizen Review Committee should be established at an early stage in the study and should receive progress reports, analyses and evaluations as they become available for review and comment. Meetings should be open to the public.

(b) River basin studies should be released as a series of periodic (perhaps annual) technical progress reports. This is not to be confused with the annual work reports required under Sec. 204 (2) of the Water Resources Planning Act. (1965).

(d) A continuous dialogue should be maintained between the Citizens Review Committee and the Coordinating Committee undertaking the river basin study, together with any independent professional body that may be established.

(e) Each progress report should contain an element responding specifically to the citizen review comments elicited by the preceding report. The final comprehensive report should then be made available for a 90-day review by the established Citizens Review Committee.

(f) It is recommended that the final comprehensive report should be completed within three years.

For more effective participation in terms of the Connecticut River Basin Study itself, it is clear from examination of the materials related to implementing institutions and procedures, that safeguards already exist for considering the ecological and environmental impact of structural elements. Concerned citizens--who have already achieved significant legislative measures for environmental protection--can continue to press for the establishment of desirable ecological and environmental criteria as part of the on-going implementation process.

In the light of the growing experience of CRC members with the CRBS proposals, and in the interests of continuity, it is suggested that consideration be given to including at least some of these members on the Citizen Advisory Board recommended by the subcommittee on implementation, within the Connecticut River Basin Program.

It should consider reports from new groupings of subcommittees composed of residents affected by CRBS projects, directly in terms of locational proximity, and indirectly in terms of downstream benefits or other regional factors.

These project subcommittees would have access to all necessary technical documentation relevant to each project in time to prepare considered reports on which the CAB can develop effective recommendations to the CRB Program.

Another issue that has to be considered is the question of establishing an effective methodology for weighting the four criteria established by the Special Task Force report to the

Water Resources Council, viz:

1. To enhance national economic development
2. To enhance the quality of the environment
3. To enhance social well-being, and
4. To enhance regional development.

The importance of weighting goes far beyond establishing the relative merits of projects within the river basin as functional elements of a comprehensive plan. It could be used as the basis for determining optimal population levels, within an acceptable range of social well-being, with respect to the environmental quality of a given region. Most importantly, it would touch on delicate questions concerning the equitable rights of one group of citizens against the rights of another, or of one geographic region against another-- even of the Connecticut River Basin against the rest of New England.

With every respect for the right of the CRC to assert its own judgments, it is suggested that the CRC should recommend research and development, on a national scale, of methodological weighting procedures, permitting differential regional characteristics to develop as a reflection of each region's unique heritage and traditions, that yet would clearly delineate the rights of the larger polity as against the rights of the smaller polity. The supreme difficulty is determining at what point the legitimate rights of local residential groups become selfish interests detrimental to the larger region. This can be relatively easily established in terms of, for example, water quality and water supply. It becomes exceedingly difficult in terms of flood control, power generation, recreational facilities, ecology, environmental quality, and economic development, particularly under the pressures of growing population, a perennial lack of adequate funding, and dwindling resources. An established weighting methodology would go far towards providing politically responsible decision makers with a more soundly informed basis for determining the consequences of their developmental decisions.

This leads to the final issue that has emerged. The time-lag between the initiation of the Connecticut River Basin Study and the implementation of any one project is of the order of eight to ten years. It becomes a matter of considerable urgency, not only for the CRBS, but for future basin studies, that potential

water impoundment sites be identified as a matter of top priority, and a 'freeze' be placed on such sites, with a total prohibition of any development that could inhibit future implementation of river basin study proposals. This freeze should cover an extended period of time, subject to the development of an equitable compensation formula. In the time framework of river basin studies, the nation cannot afford to lose any potential site to incompatible development.

Turning to more specific assumptions, the time available from December 15, the opportunity for considerably deeper reading of the CRBS nine-volume report, and the references to a much wider range of related reports and studies originating from various federal agencies leads to the following more considered response to these assumptions:

Increased population and per capita income: (p. V-10)

The estimated increases of 85% in population and 500% in per capita income over the period 1960 to 2020 appear statistically sound and based on reasonable assumptions of the Connecticut River Basin growth characteristics, vis-a-vis New England and the nation as a whole. However, an essential point is that these are not very critical, since the basin's development needs are not particularly sensitive to time periods of even ten years over a sixty year projection. It is, however, necessary to reinforce the concept of preserving inviolate potential sites for water impoundment for any purpose, once they have been identified, so that future generations will inherit a maximum freedom of choice.

The timely availability of water in sufficient quantity and quality to support the projected economy: (p. V-1)

The observation that general developmental measures may not be critically sensitive to time does not hold for emergencies, such as flood risk, nor for meeting the legitimate demands for economic opportunities by CRB residents. It is suggested that until such time as an optimal population level can be determined for a given region, and 'natural' population concentrations continue, under-and unemployment are societal pollutants that demand at least as high a priority of consideration as the depollution of the environment. Projects contributing to economic development must be given full consideration.

At the same time every effort must be made to minimize the detrimental effects on the environment discussed on pp. V-38 through 42 in the Main Report.

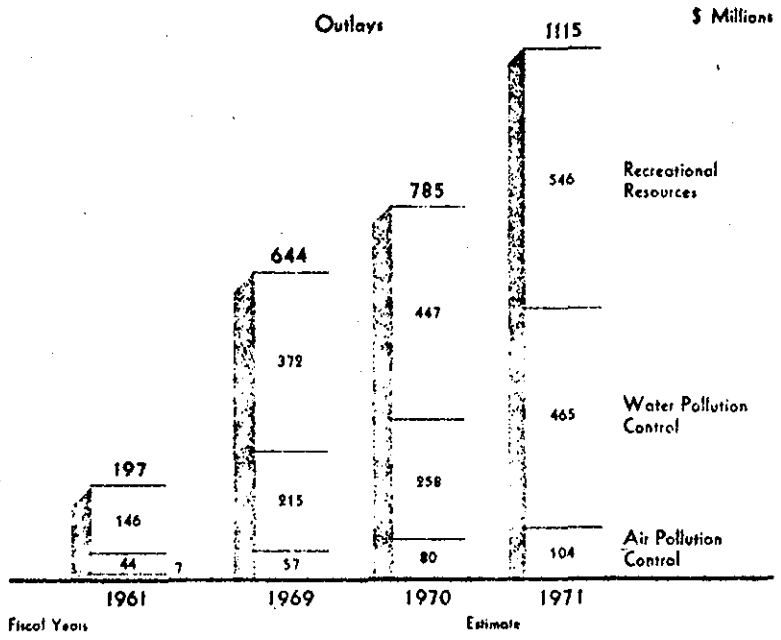
A continuation of high or present levels of national employment and activity: (p. V-1)

Employment conditions in the whole of the Connecticut River are not known, but in CRB V unemployment and underemployment are high, and conditions are worse than a year ago. This is suggested as a powerful consideration in rejecting any irresponsible addition to the procedural delays already inherent in the implementation process before final decisions can be reached.

No major depressions or wars, and a continuation of the current relative needs of the civilian economy and the national defense: (pp. V-1/2)

The following extracts from The Budget in Brief (pp. III-6-7) indicate federal recognition of the problems of achieving adequate environmental control. The escalated cost allocations projected from 1971 should be welcomed, but it is suggested the CRC recommend even greater increases in allocations for environmental research, development and control, and the identification of outlay on environmental quality as a separate budgetary function.

Major Environmental Quality Programs




## THE QUALITY OF THE ENVIRONMENT

Our environment is becoming increasingly unpleasant and unhealthy. We are plagued by polluted air, too many contaminated rivers and lakes, and inadequate recreation opportunities.

Primary responsibility to reduce pollution appropriately rests with State and local governments and the private sector. However, the Federal Government must exert leadership and provide assistance to attack these problems *now*.

*Clean water.*—The President recommends a sustained national commitment to restore the quality of our water. Authority is being requested for a 5-year program of grants to communities for $10 billion of sewage treatment facilities construction when coupled with State and local matching funds.

A fundamental reform of the municipal waste treatment program is being proposed to assure that Federal funds go to areas where the benefits are clear, and where State and local governments have developed adequate programs to achieve stated goals. Cost sharing for treatment works must be equitable and create incentives for reducing the amount of industrial waste that would otherwise have to be treated in municipal systems.

Finally, increased assistance to State water pollution control agencies and a strengthening of enforcement provisions are recommended.

*Clean air.*—To help control air pollution, additional assistance will be provided to State and local control agencies. Federal efforts to develop technology to control sulfur and nitrogen oxides will be accelerated. While private industry should provide the greater part of the expertise and funds needed to solve the problem, Federal outlays will increase by 31% in 1971.

*Open space.*—Improving the environment also means providing adequate park and recreation open space—particularly in and near cities, where the need is the greatest and land prices have been escalating most rapidly. Appropriations are recommended for all the funds presently authorized for the Land and Water Conservation Fund, in order to speed acquisition of Federal park lands and increase assistance to States to provide more recreation opportunities. Wilderness, open space, wildlife—once gone—are lost forever.

BUDGET RECEIPTS BY SOURCE AND OUTLAYS BY FUNCTION, 1960–1971 (in millions of dollars)

| Description | Actual | | | | | | | | | | Estimate | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
| **RECEIPTS BY SOURCE** | | | | | | | | | | | | |
| Individual income taxes | 40,741 | 41,338 | 45,571 | 47,588 | 48,697 | 48,792 | 55,446 | 61,526 | 68,726 | 87,249 | 92,200 | 91,000 |
| Corporation income taxes | 21,494 | 20,954 | 20,523 | 21,579 | 23,493 | 25,461 | 30,073 | 33,971 | 28,665 | 36,678 | 37,000 | 35,000 |
| Social insurance taxes and contributions (trust funds): | | | | | | | | | | | | |
| Employment taxes and contributions | 11,248 | 12,679 | 12,835 | 14,746 | 16,959 | 17,359 | 20,662 | 27,823 | 29,224 | 34,236 | 38,914 | 42,842 |
| Unemployment insurance [1] | 2,667 | 2,902 | 3,337 | 4,112 | 4,045 | 3,819 | 3,777 | 3,659 | 3,346 | 3,328 | 3,340 | 3,335 |
| Contributions for other insurance and retirement | 768 | 857 | 875 | 946 | 1,008 | 1,081 | 1,129 | 1,867 | 2,052 | 2,353 | 2,551 | 2,931 |
| Excise taxes: | | | | | | | | | | | | |
| Federal funds | 9,137 | 9,063 | 9,585 | 9,915 | 10,211 | 10,911 | 9,145 | 9,278 | 9,700 | 10,585 | 10,872 | 12,059 |
| Trust funds (highway) | 2,539 | 2,798 | 2,949 | 3,279 | 3,519 | 3,659 | 3,917 | 4,441 | 4,379 | 4,637 | 5,068 | 5,461 |
| Estate and gift taxes | 1,606 | 1,896 | 2,016 | 2,167 | 2,394 | 2,716 | 3,066 | 2,978 | 3,051 | 3,491 | 3,500 | 3,600 |
| Customs duties | 1,105 | 982 | 1,142 | 1,205 | 1,252 | 1,442 | 1,767 | 1,901 | 2,038 | 2,319 | 2,260 | 2,260 |
| Miscellaneous receipts [2] | 1,187 | 919 | 843 | 1,023 | 1,084 | 1,594 | 1,875 | 2,108 | 2,491 | 2,916 | 3,681 | 3,614 |
| Total receipts | 92,492 | 94,389 | 99,676 | 106,560 | 112,662 | 116,833 | 130,856 | 149,552 | 153,671 | 187,792 | 199,386 | 202,103 |
| Federal funds | 75,650 | 75,179 | 79,703 | 83,550 | 87,205 | 90,943 | 101,427 | 111,835 | 114,726 | 143,329 | 149,579 | 147,600 |
| Trust funds | 19,228 | 21,800 | 22,652 | 25,799 | 28,518 | 29,230 | 32,997 | 42,935 | 44,716 | 52,009 | 58,141 | 64,107 |
| Intragovernmental transactions | −2,385 | −2,589 | −2,680 | −2,788 | −3,06 | −3,339 | −3,568 | −5,218 | −5,771 | −7,547 | −8,335 | −9,605 |
| **OUTLAYS BY FUNCTION [3]** | | | | | | | | | | | | |
| National defense | 45,908 | 47,381 | 51,097 | 52,257 | 53,591 | 49,57 8 | 56,785 | 70,081 | 80,517 | 81,240 | 79,432 | 73,583 |
| International affairs and finance | 3,054 | 3,357 | 4,492 | 4,115 | 4,117 | 4,340 | 4,490 | 4,547 | 4,619 | 3,785 | 4,113 | 3,589 |
| Space research and technology | 401 | 744 | 1,257 | 2,552 | 4,170 | 5,091 | 5,933 | 5,423 | 4,721 | 4,247 | 3,886 | 3,400 |
| Agriculture and rural development | 3,322 | 3,340 | 4,123 | 5,139 | 5,[illegible]5 | 4,807 | 3,679 | 4,376 | 5,943 | 6,221 | 6,343 | 5,364 |
| Natural resources | 1,019 | 1,568 | 1,686 | 1,505 | 1,972 | 2,063 | 2,035 | 1,860 | 1,702 | 2,129 | 2,485 | 2,503 |
| Commerce and transportation | 4,774 | 5,048 | 5,408 | 5,743 | 6,482 | 7,364 | 7,135 | 7,554 | 8,047 | 7,873 | 9,436 | 8,785 |
| Community development and housing | 971 | 191 | 589 | −880 | −185 | 288 | 2,644 | 2,616 | 4,076 | 1,961 | 3,046 | 3,781 |
| Education and manpower | 1,286 | 1,499 | 1,732 | 1,732 | 2,028 | 2,533 | 4,523 | 6,135 | 7,012 | 6,825 | 7,538 | 8,129 |
| Health | 756 | 873 | 1,139 | 1,393 | 1,737 | 1,730 | 2,543 | 6,721 | 9,672 | 11,696 | 13,265 | 14,957 |
| Income security | 17,977 | 20,956 | 22,205 | 23,854 | 24,833 | 25,453 | 28,751 | 30,881 | 33.835 | 37,399 | 43,832 | 50,384 |
| Veterans benefits and services | 5,426 | 5,688 | 5,625 | 5,520 | 5,681 | 5,722 | 5,920 | 6,897 | 6,882 | 7,640 | 8,681 | 8,475 |
| Interest | 8,299 | 8,108 | 8,321 | 9,215 | 9,810 | 10,357 | 11,285 | 12,588 | 13,744 | 15,791 | 17,821 | 17,799 |
| General government | 1,327 | 1,491 | 1,650 | 1,810 | 2,040 | 2,210 | 2,292 | 2,510 | 2,561 | 2,866 | 3,620 | 4,084 |
| Allowances | | | | | | | | | | | 475 | 2,575 |
| Undistributed intragovernmental transactions | −2,296 | −2,449 | −2,513 | −2,644 | −2,877 | −3,109 | −3,364 | −3,936 | −4,499 | −5,117 | −6,088 | −6,639 |
| Total outlays | 92,223 | 97,79 | 106,813 | 111,311 | 118,584 | 118,430 | 134,652 | 158,254 | 178,833 | 184,556 | 197,885 | 200,771 |
| Federal funds | 74,865 | 79,336 | 86,594 | 90,141 | 95,761 | 94,807 | 106,512 | 126,779 | 143,105 | 148,819 | 156,703 | 154,936 |
| Trust funds | 19,743 | 21,048 | 22,898 | 23,958 | 25,884 | 26,962 | 31,708 | 36,693 | 41,499 | 43,284 | 49,517 | 55,440 |
| Intragovernmental transactions | −2,385 | −2,589 | −2,680 | −2,788 | −3,061 | −3,339 | −3,568 | −5,218 | −5,771 | −7,547 | −8,335 | −9,605 |

[1] Includes Federal funds of $339 million in 1960.

[2] Includes both Federal funds and trust funds.

On the question of planning principles and criteria, it is well documented that the Connecticut River Basin Study, prepared under the direction of Senate Document 97, modified to some extent by the Water Resources Planning Act of 1965 resulted in three declared objectives of National Efficiency, Regional Efficiency and Environmental Quality, but with a heavy economic orientation.

It would be very appropriate to accept the CRBS report in this context, recognizing the considerable amount of creative effort that has been expended on the study, which should prove of enormous benefit to the river basin.

It would also be appropriate to recognize that a great deal of work remains to be done in implementing the proposals in the light of existing review and recommendation procedures through local, state and federal agencies. It is at this point that the CRC can fulfill another most constructive function by endorsing those elements of the plan that are seen to be immediately acceptable, and identifying those elements or specific projects that appear questionable in the light of more recent environmentally-oriented legislative criteria, so that the necessary chain of further studies and modifications can begin at the earliest possible date. The amended responses recommended by the subcommittee on assumptions to each of the recommendations of the CRB Coordinating Committee given on pp. XIII-XV of the Main Report can therefore be expressed as follows:

1. Agreed. The Basin Plan, as presented and discussed in this report, be accepted and used as a guide for the development and beneficial use of the water and related land resources of the Connecticut River Basin.

2. Agreed with reservations. Projects and programs in the ten to fifteen year category, referenced as the 1980 Plan for Development be implemented through appropriate agencies and established procedures pertaining to both authorization and funding only if they carry the specific endorsement of legally concerned governmental agencies, including the states.

3. Agreed, subject to sections #2 and #5.

4. Agreed. Concerned federal and state agencies must continue to exercise their legal responsibilities to review segments of the 1980 Plan which come under their jurisdiction.

5. Agreed, with the following comments:

The New England River Basin Commission (NERBC) should develop a Connecticut River Basin Program (CRBP) with a Citizens Advisory Board. It should be empowered to create subcommittees composed of residents of the basin affected by specific proposals of the CRBS either directly or indirectly, not necessarily limited to CAB members. The CAB and subcommittees should have adequate access to all the necessary technical documentation relevant to each project.

The NERBC should be authorized and adequately funded to undertake or coordinate the further studies found necessary to respond effectively to changed environmental and ecological legislation existing at the time of the implementation of any CRBS proposal, and to meet the requirements of legally concerned government agencies. (See appendices AVIII-XIV for selected extracts of existing environmental legislation.

6. Agreed, subject to sections #2 and #5.

7. Agreed. Any additional studies required should proceed as soon as practicable.

8. Agreed, with the additional observation that the CRBP must be adequately funded to undertake the responsibility of being the prime source of information available to the public.

A final comment must be made. The recommendations of the Coordinating Committee enhance the potential for regional development with a pronounced orientation toward economic criteria.

If the current public concern over the environment and the basin's total eco-system is to be taken seriously, the consequences cannot be shirked, either in terms of the nature and depth of the required ecological research, nor in terms of the additional costs that will inevitably be incurred. On this generation will fall the burden not only of ensuring the future environmental quality of the region, but paying for the accumulated erosion of the environment attributable to past generations.

## Summary of Recommendations and Priorities

1. NERBC should be authorized and adequately funded, if necessary on an interim basis with a supplementary budget, to continue with such immediate on-going action as is recommended by the CRC.

2. A weighting methodology applicable to the four objectives of economic development, the quality of the environment, social well-being and regional development should be established.

3. At the highest national level, the establishment of optimal regional levels of population, economic activity, social well being and environmental quality should be determined.

4. Sites identified as potentially suited for water impoundments should be conserved, and future incompatible developments prohibited, subject to equitable compensation, to maintain maximum freedom of choice for future generations.

5. Environmental protection should be identified as a separate national budgetary outlay function, and adequate, realistic research and controls should be developed and funded.

6. Members of CRC should receive copies of all future reviews, papers and studies relevant to CRBS, to enable them effectively to contribute to public acceptance of approved CRBS measures.

# REPORT OF THE SUBCOMMITTEE ON POWER

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## Introduction

Appendix I of the Comprehensive Water and Related Land Resources of the Connecticut River Basin is a report of Electric Power and was prepared by the New York Regional Office of the Federal Power Commission. It is a general but concise review of the current problems and projections facing the power industry. Early recognition of diverse and rapidly changing factors confronting utilities is indicated and flexibility to accommodate management decisions is recommended. The subcommittee on power is generally in agreement with findings of the report.

Electrical power is also discussed on pages V-38 to V-42 in the Main Report (Volume I). The problems associated with power production and the changing load patterns are succinctly described. It should be noted that the Connecticut River basin is expected to change from an exporter to an importer of power. There seems to be misunderstanding in some quarters regarding the nature and amount of new power development included in the Early Action Plan and the relationship of that development to other elements of the Plan.

Adequate power is one of the prerequisites for the well-being, economy and vitality of the river basin. Unfortunately, all methods of energy conversion for production of power involve waste products which have objectionable impact on the environment. The problem thus becomes one of finding the optimum solution involving the combined technological, economic, and ecological factors.

The subcommittee believes that the object of sound power planning should be to meet "outdoor" environmental requirements without resorting to that degradation of the "indoor" environment which would result from planned or induced power shortages.

There have been suggestions that rate penalties should be imposed to discourage electrical use. (This is more popular with some environmentalists than with the general public.) Entirely aside from the dubious proposition that price manipulation be used to choke off public demand for a desired commodity, it is quite likely that changes in actual cost relationships in the electrical field will tend to exert increasing pressure against any excessive use of electricity.

Recent and extraordinary increases in the cost of construction, cost of money, cost of environmental accommodation and cost of fuel may well double the cost of generating electricity during the Early Action Plan years. Because generating costs unlike distribution costs attach with substantial equality to each kilowatt hour sold, (assuming equal load factors), a rise in the former will result in imposing the highest percentage rate increases on the bigger, low-rate users. Thus, working of normal cost-price constraints should make unnecessary any contrived use-dampeners.

FPC Commission Chairman John N. Nassikas has pointed to the fact that any suggestion that reduction in electric power in the 1970's would decrease the volume of facilities and thereby reduce the environmental impact may be self-defeating. It is likely that such a move would increase the demand for other products or forms of energy which may have an equal or greater effect on the environment. Overt efforts to discourage power production by way of the market mechanism may have side effects that few would wish to encourage.

Data and information for Appendix I were derived from studies and reports of FPC and the power industry, combined with economic projections dealing with the Connecticut River Basin. Increased awareness of the aesthetic and ecological considerations becomes evident as the problems involving power are increased by population increase and concentration and per capita demand. These factors are described in the seven sections of Appendix I in a commendable fashion. Following are subcommittee views concerning each section:

Section I - Description of the Power Market

One of the early discussions of the subcommittee on Power was concerned with whether or not the report considered in-basin power production only. Section I indicates that the Connecticut River Basin will be supplied by Power Supply Areas 1 and 2. PSA 1 consists of the State of Maine and the remainder of New England is in PSA 2. Interconnection also exists with New York and Canada. It appears that the trend is toward a regional bulk power supply economically viable for the area comprising the six New England States. The basin should not be independent with regard to power production and consumption.

The fact that approximately 86 percent of the Basin population is concentrated in Connecticut and Massachusetts, (which contain about two-fifths of the total area) compounds the siting problems of power plants and transmission lines. The industries of the region are in a state of change and expanding populations in adjacent areas are making increasing demands on the environment for recreational purposes. The Connecticut River Basin must be considered as an integral part of the whole New England Region.

Section II - Power Market Requirements

Historical records, past experience and current trends were the principal tools used to forecast power consumption in Appendix I. Exponential growth of both demand and energy requirements of the utility market area were illustrated in both tabular and graphical form. However, continuous updating is required as fuel and labor costs escalate and uses of power become more wide-spread. An example of this may be observed on page I-9 where a plot of power requirements and peak demand appear on semi-logarithmic paper. The plots show a bend to the right which is indicative of maturity. More recent data point toward a linear plot or simple exponential growth. This would mean approximately a four-fold increase in power in the next twenty years.

The power requirements closely conform to population patterns and per capita consumption is nearly uniform throughout the basin. The subcommittee endorses the current approach of the power industry in reduction of promotional procedures and increased efforts for production with concern for environmental impact.

Section III - Utility Power Supply for Market

The options available to the electric utility generation planners have become increasingly important in the past few years. Nuclear generation has become competitive, pumped storage and gas turbine peaking capacity have indicated system economics, and potential for development of relatively new methods appears to be a real possibility. Extra high voltage (EHV) transmission permits increased flexibility in locating large generating units at fuel sources or near available cooling water. It should be recognized that electricity is a relatively clean form of energy at the point of consumption. Power system interconnection permits larger unit additions and increases the dependability of the system. The desirable goal would seem to be determination of the optimum mix of the power sources for proper balance of the factors involved.

It appears to the subcommittee that the power industry is making real effort to supply the demand for power with proper respect for the environment. The exponential demand for power suggests that, in terms of percent of the total, there is an opportunity to virtually build a new power system during the next 20 years. This does not mean that old plants would be abandoned but merely pushed higher on the load duration curve. Base load will primarily be supplied by nuclear plants and peaking power from conventional and pumped-storage hydroplants. The gas turbines (IC/GT) seem to be increasingly important in system planning because of their adaptability to reserve and peaking loads and also because of relatively low capital cost, flexibility, and lower siting problems.

Sources of power such as Magnetohydrodynamics (MHD), solar power, wind power, thermionics, and fuel cells were studied by members of the subcommittee, but most of the technical literature expresses little hope of any early significant breakthrough for any of these as a major source of power. Northeast Utilities has recently reported a concerted effort toward advancement of MHD and there is some optimism concerning use of fuel cells. The subcommittee endorses continued research and public effort toward finding new sources of power.

Transmission line and distribution yards appear to be particularly obnoxious to many people and present a real siting problem. The present cost of undergrounding transmission lines appears to be as much as forty times the conventional method, thus limiting their application. Considerable attention has been devoted to EHV transmission by the utility industry and application of high voltage D.C. (HVDC) for bulk power transmission. HVDC has a lower cost per KVA for underwater, underground or overhead lines but presents considerable problems at its terminal points. The subcommittee does not currently recommend dependency on Canada for power because it is the general policy of the Canadian Government that export licenses be denied if a need exists in Canada. Additions to the power pool, such as the Dickey-Lincoln School Project on the St. John's River in Maine and some undeveloped rivers in Canada, could change the picture somewhat. The Connecticut River Basin should be receptive to logical revisions in system planning.

Section IV - Future Generating Capacity Requirements

The electric power industry has made a real research effort in all phases of utility operations. Power production research has been primarily concerned with various forms of nuclear reactors such as the gas cooled, breeder, heavy water and fusion processes. Nuclear and pumped storage power sources appear to present the best possibilities for the bulk of the market. System expansion to the year 1990 is reasonably well-defined and utilities have made sufficient plans to insure availability of power.

Power companies have provided many recreational benefits for the public in the past and continue to develop increased awareness of environmental factors. Staff additions with expertise in ecology, model studies, and other means of providing answers to questions concerning effects of power production have been explored. The subcommittee recommends that these be continued and expanded to provide the optimum balance of technological and ecological factors.

Section V - Undeveloped Hydroelectric Power in the Connecticut River Basin

Two hundred power sites for conventional hydro power plants were screened by the Corps of Engineers but even the three most promising sites have low benefit-cost ratios with private financing. No new dams for conventional hydroelectric power generation appear likely in the Early Action Plan.

Pumped-storage hydro-electric sites are relatively numerous in New England and Appendix I lists ten of the more economically advantageous ones in the Connecticut River Basin. Their potential is 9,900 MW. This source of power seems most advisable.

Section VI - Valuation of Hydroelectric Power

Residential consumers of electric power in New England pay 30 percent more per kilowatt hour partly because annual use is 24 percent less than the rest of the United States. According to a survey of the Federal Power Commission, the average rate charged for specific quantities of electricity (residentially) is from 11 - 14 percent higher than the average rate charged for such quantities on the basis of national average. Fuel costs continue to escalate and power rates are expected to follow suit. Pumped-storage and gas-turbine power plants currently present the lowest cost per kilowatt of capacity.

Questionnaires returned from non-utility groups indicated some willingness to bear an increase in electric bills to preserve the quality of the environment. However increases greater than ten percent were unacceptable. Improved methods are necessary before many innovations can be made.

Section VII - Water Requirements for Thermal Electric Generation

The last section of the power report deals with the problem of thermal pollution. Increase in river water temperatures from condensing water discharges of thermal electric plants presents several effects which are detrimental to the environment. Several alternatives to "once-through" usage are available but each has associated problems. Among the methods are cooling ponds and evaporative and non-evaporative cooling towers. Related problems involve economic, aesthetic, and ecologic impairment, and water loss.

Part of the problem comes back to the definition of pollution which is "too much." If too much waste of any form is present, a pollution problem exists. Standards of temperature rise seem to be vague and apparently there is no general one for the Connecticut River Basin. Members of the subcommittee feel that a basin wide standard should be adopted and enforced. It is also recommended that research efforts be made to utilize the effluent to recapture some of the heat energy for productive purposes.

Summary and Conclusions

Comfortable living and economic expansion are directly related to availability of energy. An adequate power system compatible with the eco-system is possible and desirable. Appendix I effectively outlines a general plan for provision of power requirements to the year 2020 and provides a worthwhile portion of the comprehensive plan.

The subcommittee is generally in agreement with all the findings of the report and would like to add additional observations and endorsements:

1. Power requirements and pricing require continous updating to be realistic. A fine study was made for the New England Regional Commission by H. Zinder & Associates, Inc. Their opening sentence under basic recommendations states that "An abundant and reliable source of electric power at reasonable rates is essential for a region to prosper." The Zinder report is most comprehensive and is recommended reading for persons interested in the power situation in New England.

2. The subject of minimum release flows on the main stem of the Connecticut River has been omitted in Appendix I. Apparently this was intentional since release flows are for the purpose of benefits other than power. Hydroelectric power plant operation has been premised upon complete shutdown (except for leakage) and pricing has been based upon this mode of operation. The requirement that four power plants on the main stem release 0.2 csm (Reference Appendix Q, Report of the Subcommittee on Stream Regulation) will decrease power output and will add to the increase in power costs to the consumer. It appears to the subcommittee that the other benefits far exceed the cost and that compliance with the minimum release flow should be made a prerequisite for relicensing. The subcommittee also endorses other realistic augmentation and would recommend means of requiring power plants not up for relicensing to comply. If additional water becomes available, provisions should be made for its release. Early study should be given to the application of the 0.2 csm requirement to other main stem power dams and to the question of what requirements should apply to the dams on the tributaries. There should be appropriate monitoring of the river flow to assure compliance and a means developed to evaluate the effectiveness of the measures.

3. Power plant licensing restrictions should be made uniform and preconstruction permits should be required by each state before construction. There seems to be considerable variation in methods and timing of relicensing depending upon the type of financing, type of construction, location and other factors. It is not uncommon for applicants to have construction well under way in advance of licensing.

Environmental impact statements are now required by governmental agencies and it is recommended that these be expanded to include private agencies. Increased awareness of the ecological problems should be a major factor in planning and design of electrical power projects.

4. The position of the cost of power in the Coordinating Committee report should be clarified. The subcommittee strongly questions the inclusion of the $700 million indicated for power facilities in the $1.8 billion pricing of the Early Action Plan. There is strong agreement with the Study's environmental evaluation of power-expansion plans and control of the river regime, but it should be indicated that financing of electric facilities is more than 90 percent in the private sector. Inclusion of this large sum in the cost of the Early Action Plan tends to cloud the public's focus on the problem of allocating scarce tax dollars to high priority items such as improvement of water quality.

There are many recent reports available which could be used to expand Appendix I but the subcommittee is of the opinion that the Coordinating Committee has a report that is concise and tells it "like it is."

# REPORT OF THE SUBCOMMITTEE ON WATER SUPPLY, WATER QUALITY, FLOOD CONTROL AND COMMERCIAL NAVIGATION

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## Introduction

The Study prepared by the Coordinating Committee is a professional assessment both specific and conceptual in nature. It was carried out over a particular period in time and thus reflects that period's predominant planning philosophy, criteria, and techniques. At the beginning of the Study, national and regional economic development considerations tended to dominate planning objectives, and cost/benefit analysis tended to ignore knotty questions of social costs and benefits. During the course of the Study the nation discovered the environment and environmental considerations assumed greater importance in planning processes. In the summer of 1970 the Special Task Force of the Water Resources Council issued a report entitled, "Principles for Planning Water and Land Resources." In this a clear emphasis was placed on well being from the environmental viewpoint, with economic development considerations to be carefully evaluated within such limits.

The Connecticut River Basin Study partially reflects these new guidelines, but its recommendations are understandably more the product of the old guidelines than the new. It is hoped that the Citizens Review Committee, at this later point in time, can make a real contribution by expressing more up-to-date judgments in regard to weighing of objectives, and to desirability or present political feasibility of various alternative solutions to water and related land use problems in the Connecticut River Basin.

The Study has resulted in a monumental accumulation of data and in a method of intercommunication between agencies, states, and regions. It should be treated as a provisional framework and data base within which reasoned arguments for and against specific proposals may be set forth. The Early Action Plan has many good recommendations which should be implemented as soon as possible. In other areas more data and study may be needed before action stages. There are also controversial parts. The following discussion will put forward the reactions of the Sub-Committee on Water Supply, Water Quality, Flood Control and Commerical Navigation.

General Concerns

1. There is an obvious lack of clearly delineated alternatives in the Early Action Plan. In many instances alternatives have not been developed to the point where they can be considered for practical application. What is presented is a plan, not alternative plans to which each of the criteria of national efficiency, regional development, and environmental quality can be applied.

2. There seems a preference for structural over non-structural solutions. This no doubt stems from long-standing institutional concerns, from lack of economic analysis techniques which take into account unmeasurable or intangible values, and from judgments as to the political feasibility of certain non-structural approaches. This should not be taken to mean that the sub-committee condemns structures. In some cases, especially in the water quality field, structures are the sine qua non.

3. The Study does not give adequate weight to the environmental quality objective. More emphasis must be given to these factors as the decisions are made in regard to implementation of the Early Action proposals. There also will be opportunities as the plan is continually updated in light of changing social, political, technological, and economic conditions. An absolute necessity is significant studies on the ecological impact of various alternatives before the commencement of the new projects.

All of these general concerns indicate the need for a staged implementation process with continuous study and evaluation. The sub-committee places prime importance on a workable implementation mechanism.

Water Quality

The sub-committee strongly endorses the high priority given in the Study to improvement of water quality throughout the Connecticut River basin. There is unanimous agreement that the eventual goal should be a classification of no lower than "B" quality for the whole river system, including the tributary basins. Some areas, i.e. the upper reaches of the river, hopefully will attain an "A" quality rating. The sub-committee urges continuous and coordinated state efforts toward this end, as well as adequate federal funding.

The emphasis on new and improved waste water treatment facilities at least to the secondary treatment level seems a useful first phase approach. In the long run, however, advanced waste treatment processes may be required if a "B" quality is to be attained or maintained in receiving waters. Several promising new recovery techniques should be looked at and evaluated, especially means of recovering agricultural run-off and recycling of domestic sewage.

The sub-committee strongly supports the recommendations for further detailed study of certain pollution problems, particularly those associated with industrial wastes, phosphates and nitrates, mercury, pesticides, water borne viruses, sludge accumulations, and nuclear or thermal discharges. Also it supports continuing and strong measures to solve the problem of combined storm and sewer lines in metropolitan areas. As more experience is gained and study results come in, present water classification standards should be revised, added to, and refined as needed.

The Comprehensive Study considered dilution of wastes by flow regulation or augmentation as a means of improving stream quality. However, the sub-committee is not clear on specific requirements for stream flow for water quality, for recreation of certain types, or for various fisheries programs. These requirements need clarification. Great fluctuations in flows clearly do present problems though, and the sub-committee sees significant potential in better regulation of flow releases from existing power reservoirs. The standard of .2 cubic feet per second per square mile of drainage area as a minimum flow from these structures seems reasonable, and the sub-committee recommends that it be extended throughout the basin as soon as possible. The advisability of regulating the flow from other types of existing impoundment structures to provide this minimum, or some other, flow rate should also be investigated, though the sub-committee recognizes that under certain conditions such releases may be in serious conflict with reservoir purposes.

There is complete agreement with the Study that augmentation of flow should not be considered a substitute for treatment of all wastes to at least the secondary level before discharge into the river. The sub-committee further agrees that the role of low flow augmentation be studied only after the implementation of planned treatment facilities, analysis of their performance, and evaluation of new waste treatment technologies. If low flow augmentation is found to be the

only answer to a particular or localized pollution problem, the committee prefers solutions especially designed to that specific problem. The sub-committee questions any general justification at the present time of new large impoundments in terms of low flow augmentation benefits for water quality purposes. There are still too many unknowns in regard to advanced treatment alternatives and in regard to augmentation effects on stream channels and ecological systems.

The Study has examined a number of supplementary or alternate means of achieving water quality objectives, such as holding lagoons, advanced waste treatment, diversion of wastes, and redesign of plant processes. There is some concern in the sub-committee that the true cost of achieving good water quality is not known. The most effective and economical combination of alternative methods of achieving water quality also must be in accord with other water resources and environmental quality goals of the basin. It therefore becomes evident that some mechanism for continuous reevaluation of both standards and implementation plans must be an important part of the basin plan. The sub-committee strongly endorses the proposal for a Connecticut River Program in the NERBC for this purpose.

Water Supply

In general the sub-committee approves the recommendations of the Comprehensive Study in regard to water supply. There are only two areas of concern.

It is understood that determination of groundwater supplies throughout such a large region is a long and costly process and of necessity could be treated in only a general way in this Study. However, long term choices in regard to water supply, water quality, diversion, etc., call for more information than is now available. For example, groundwater aquifers may be very important in the future as storage both for flow augmentation and as natural treatment plants. Wastewater disposal to injection wells for final treatment and ultimate return flow may be found far preferable to addition of water borne nutrients to the river system. The sub-committee recommends acceleration of the program for determining location and available yield of ground water sources in the basin and for protecting these sources as defined. Additionally, careful consideration should be given to the environmental implications of various possible uses.

In view of the fact that the availability of water and the demands for future water supply in the Connecticut River valley have not been fully studied or planned for, the sub-committee is concerned over statements by responsible state and federal agencies that there exists a substantial surplus of water in the Connecticut River valley that will not be needed for valley use, and that such waters should be diverted for supply to areas outside the basin, specifically the Boston MDC area. The sub-committee feels that the concept of controlled diversion of truly surplus waters is reasonable and supports the sharing of such waters from the Connecticut River as proposed in the Northfield Mountain pump storage project. However, this is conditional upon recognition of the riparian rights of the valley's communities, industries, and individuals to the waters within the Connecticut River watershed, and the right of return of these waters at such future time as they may be needed for water supply.

The feasibility of various arrangements should be investigated. Such waters might be returned directly through the natural river system, or by an expansion of existing service areas by the Boston MDC. This expansion in addition to covering the Springfield-Holyoke-Chicopee metropolitan area might well extend down into the northern part of Connecticut where water shortages are anticipated to occur around the turn of the century.

Additional conditions should include: a regional mechanism for allocation of water; proper monitoring of diversion volumes and reporting to an independent authority such as the NERBC; also the possibility of establishing a quid pro quo such as expanding recreation on Quabbin Reservoir in return for that reservoir's receiving surplus Connecticut River waters. These conditions should be agreed to by water authorities before further diversion takes place.

This sub-committee recommends that various systems for diverting valley riparian waters which are currently being investigated (i.e. Tully Reservoir, Millers River, Deerfield River and locations on the main stem) not be immediately undertaken but be referred to an independent regional group such as the NERBC for further consideration. The term "excess flows" needs to be more clearly defined. This will require exploration in depth of the ecological, social and economic measurements used in determining "excess." This may also be changeable over time as new knowledge and water uses come into play. Final determinations should therefore take into account: ecological studies as to long term effects of various levels of diversion, especially from tributaries; future Connecticut basin water supply and demand structures; and alternative means of meeting Boston MDC needs, such as use of the Merrimack River, water recycling, and pricing or metering techniques to affect demand.

## Flood Control

The sub-committee considered several questions in regard to flood control for the Connecticut River basin: (1) what is the need; (2) what analysis techniques were used in examining possible flood control measures and what factors did these include or not include; (3) are there flood control alternatives which should receive greater emphasis; (4) and what is the long term effect of current funding patterns on choice of flood control programs.

## Need

It is the feeling of this sub-committee that the Study Report does not clearly explain the risks involved which substantiate the need for a new system of large multi-purpose or flood control dams in the Connecticut River basin. For example, sub-committee understanding of the information available indicates that some of the existing urban centers
along the Connecticut River in Massachusetts and Connecticut may not be presently protected against severe flooding from major storms similar to several which actually occurred in the last 40 years had such storms followed slightly different paths or occurred at different times of the year. However, the report is not clear on the probabilities of such events, their impact if they occur, nor the costs of varying degrees or modes of protections.

The Study states that flood control protection for the lower Connecticut River basin calls for control of 25% of the drainage area above Hartford, Connecticut, and that only 19% coverage is considered provided by projects to date. This is obviously a "strategically located" 25%. However, precisely what these figures mean or include is not clear from the Report. Nor does the sub-committee find this objective adequately delineated to serve as a criterion against which specific alternatives may be evaluated.

The sub-committee feels that the term "flood control" is an often misunderstood and perhaps illusory concept. What is actually involved is a modicum of flood protection or flood damage prevention. And such protection is never complete. There is always some risk. The real question then becomes one of level of protection desired or degree of risk that one is willing to accept. Different individuals will react in different ways, i.e. those who may experience or be held accountable for loss of life or property from floods may have different feelings as to "acceptable" risk than others. This is a matter of judgment and choice.

To make any reasoned judgment, or to set priorities, calls for some understanding of the probabilities of occurrence of various flood discharges and the probable damages associated with each. It is understood that flood frequency or probability calculations are based on limited streamflow records and are inherently not precise, even ignoring trends or cycles which might be the result of climatic changes, land use changes, weather modification practices, construction of dams upstream, etc. The further development of a standard project flood which is a hypothetical flood that has never been known to occur is an even more difficult concept. The necessary assumptions involved make estimates of risk or probability of occurrence even more tenuous.

Recognizing that the state of the art, at its best, cannot be precise and indisputable, the sub-committee still has no clear understanding from the Report as to what level of risk has been selected for the proposed program or what would be the effect of specific structural measures proposed on that or other possible choices as to risk level. In conclusion, the citizens' group feels that the Study Report does not adequately explain why or which new large flood control impoundments are essential, what alternative measures are feasible, and what sacrifices may be required in terms of environmental quality and personal income.

Methodology

The sub-committee has some questions as to whether the techniques used in evaluating specific programs for flood control are adequate in light of current national objectives and priorities. For example, the concepts and scope of benefit/cost analysis have been changing over the period of the Study, and especially rapidly in the last two years. What now seems called for requires a blending of economic and social analysis, with adequate technique not always available. However, until ways are developed for taking into account intangible values, social costs and benefits, and direct but perhaps longer term or less evident impacts, it will be difficult to gain a true estimate of the worth of any proposed program.

In general in this Study there seems a need for additional economic and social data on the effects of dams on the local areas where they are to be located. Opportunities lost, such as stream fishing, hunting, farming and forestry, wildlife habitat, tourist attractions (scenic overlooks, gorges, cascades and falls) should be considered as part of the over-all "costs" of the project if they are to be replaced. Costs as related to agriculture and forestry might well be projected over a fifty to hundred year period for assigning dollar values.

There may also be costs, both direct and indirect, from the ecological impacts of proposed measures. For example, flood control programs which regulate discharge rates and flow of sediment will in the long term have effects on the stream channel. Though adverse effects are difficult to predict, flood control proposals should include anticipated changes in stream channels and estimates of possible required expenditures to overcome problems created. Another related type of question has to do with sedimentation rates in flood control impoundments and the long term consequences of these. The sub-committee has been assured that problems in the Connecticut River basin are not great. But the estimated life expectancy of water impoundments should be known.

On the "benefits" side, the sub-committee has questions in regard to multi-purpose structures. Multi-purpose dams seem attractive from the standpoint of traditional economics of dam construction and control. However, their justification depends upon the collective benefits of purposes which, in the view of this sub-committee, may not be completely compatible. While there may be exceptions, flood control, water supply, flow augmentation and recreation within a single reservoir are all competing and probably in the long run mutually exclusive uses.

There is another major question in regard to benefits. It is not clear in the report which flood project benefits are for protection of existing property and which are for new property developments. This causes some confusion as to whether the flood control proposals are intended as "disaster prevention" or as "land development" measures. If the purposes of the program include land development, then there should be procedures for weighing the benefits of flood control programs against benefits of other possible land development programs. This is an important question of federal policy and should be considered as such.

There seems to be an implicit assumption in the Study that a favorable benefit/cost ratio is a measure of the relative desirability of a flood control project. There are many truly national needs competing for federal monies. This sub-committee feels that there needs to be more specific consideration of the relative values of the flood control proposals against other possible investments, especially those in the water resources field. For example, should the nation protect against damages from a standard project flood in the Connecticut River Valley? Whether it is a 200-year flood or a 2000-year flood, its occurrence is highly conjectural. Its devastation could hit the Valley tomorrow - or never. But, there is nothing conjectural

about water quality. Pollution is already here and growing. No matter how fast the corrective action, the problem will intensify before reversal can take place. What would be the relative benefit of money invested in pollution prevention and abatement rather than in further flood control?

Even within the flood control field, what is the relative value of different approaches? It seems to the sub-committee that the Study mainly makes the comparison of constructing a flood control facility or not constructing it, or of constructing a number of smaller structures and/or local protection devices. The choice of a flood control plan for an entire river system is very complex. A decrease in flood damage at the lowest possible relative cost probably calls both for combinations of structural and non-structural measures and for combinations of types and sizes of structures. The sub-committee questions whether serious consideration has been given to measures such as flood plain regulation or the actual removal of encroachments from hazardous locations. Until these and other non-structural measures are developed to the point of consideration for practical application, there can be no assurance that the most economical or desirable flood control system has been found.

Flood Plain Management

The sub-committee places highest priority on flood plain management for effective, long term flood damage control. The sub-committee fears that "flood control" as now practiced tends to be self-perpetuating and self-expanding. Is 25% flood coverage above Hartford a realistic long term criterion as long as there are no guarantees that increased development in flood prone areas won't continue in the valley, thereby necessitating later additional "flood control" projects at the expense of upstream valley lands? In turn, lower basin communities should have assurances that land in the upper basin states will be developed according to soil and slope capabilities to insure minimum increase of water run-off into upper basin tributaries. In general, the sub-committee cannot approve the building of flood control reservoirs at the expense of natural lands and waterways in the upper basin as long as the same old development patterns are being allowed in flood prone lands downstream. This applies equally within a single watershed.

The creation of additional dams may actually encourage flood plain development by removing the apparent danger of loss by flooding. As a result of development encouraged by a sense of security, the damage from a large flood will be greater than would have been the case without the initial degree of protection. This protection may also result in discouraging any state or local initiative to regulate the flood plains.

The sub-committee is not entirely clear as to how the small watershed programs fit into the overall flood control objectives and program for the entire basin. It is understood that, generally, small watershed programs have important land conservation values and significant flood control effects in localized and less severe flooding conditions. However, there is considerable concern over the justification and possible ecological impacts of numerous small impoundment projects.

In summary, sub-committee members strongly agree that any rational basin plan must provide for effective flood plain management as an integral part of the plan and any construction of dams large or small should be based on their need with reference to and in conjunction with accomplished flood plain zoning.

## Financing of Flood Protection

The sub-committee has questions in regard to the financing of flood protection and the effects of financing methods on choices among flood control options.

Flood protection is assumed to be primarily a federal rather than a local responsibility. However, until very recently federal measures and financial resources have been available almost exclusively for particular flood control techniques - land treatment measures and engineering structures or solutions. There has been no presumption of a concomitant federal responsibility to restrict flood plain development. This has been considered the prerogative of state and local governments. Some very limited help has been available from the federal government in the form of flood plain mapping studies by the Corps of Engineers and the Soil Conservation Service, but for the most part financially pressed local units have had little assistance.

For federal flood control projects, little or no local cost sharing is required. This is in effect a subsidy, an increase in value to individuals and local communities because the federal government seemingly underwrites risks of flooding at little or no cost to the beneficiaries. The result is that the federal government is subsidizing and encouraging flood plain development. It is quite natural for local interests to resist flood plain regulation alternatives not only because these are restrictive but because they provide no positive benefits. The sub-committee finds these effects in direct contradiction to federal objectives. The following quotations from the Study make this clear: "...The magnitude of future flood damages and the loss of life will be determined primarily by the nature and extent of development in flood plains." (Vol. I, V-71) "Without adequate non-structural safeguards, we can expect flood damages to increase at the same, or a faster rate, than we can afford to build new structural controls." (Vol. VIII, M-1-56)

Such policies make rational comprehensive planning more difficult. As long as there is federal subsidy without local responsibility, there is likely to be no adequate measure of value of projects. Something will be included for everyone, and agreement and implementation of any over-all plan will be correspondingly more difficult. This sub-committee sees this as both an important philosophical and equally important practical problem that needs much further thought and study.

Sub-Committee Recommendations re Flood Control

The sub-committee, therefore, makes the following recommendations:

1. That in general large new multi-purpose reservoirs or flood control projects not be constructed unless further study of alternatives establishes that there is a clear need. The effects of large dams are irreversible.

   The need for increased protection for existing urban centers requires clarification at the earliest possible date. As a matter of immediate priority, the NERBC should institute a study of need, alternative degrees of flood protection for these centers, and alternative means of providing such protection. The study should produce sufficient information about these alternatives to permit a thorough evaluation of them not just by NERBC and its Citizen Advisory Board but also by a broad cross section of those throughout the basin who would be affected by the alternatives. If this study and review process can not be completed

by July 1, 1973, specific steps should be taken to preserve the major options under consideration until such time as a final choice of alternatives has been made. Such steps might include: (1) the preservation of opportunities for raising or extending local protection works and (2) the reservation or acquisition or important impoundment sites for future flood control, recreation, or open space purposes pending further study.

2. That active programs of flood plain management be undertaken with all possible haste in all areas of the valley where there exists the possibility of flood damage and/or expansion. This may require new approaches, greater efforts in the practical politics of implementation, incentives, model legislation, public education, etc. The two NERBC flood plain reports are an excellent step in this direction.

It seems obvious that state governments will have to assume a stronger role in flood plain regulation. State-wide flood channel regulation seems a minimum requirement and the sub-committee strongly urges this as an important first step. Implementation of such a program requires a great deal of technical work, specifically detailed flood plain mapping. Congress should provide adequate funding for both Corps of Engineers and Soil Conservation Service programs to do these studies. In view of the need, the Department of Housing and Urban Development might also contract with private consultants to provide the necessary studies for its programs. Banks and insurance companies should be made aware of the existence and availability of such flood plain maps and studies.

The federal government increasingly gives evidence that it recognizes that along with its responsibility to provide protection from floods is a responsibility to discourage flood plain development. The sub-committee strongly endorses the recommendations of the 1966 Task Force of Federal Flood Control Policy entitled "A Unified National Program for Managing Flood Losses." Present federal policy calls for implementation of state and/or local regulation of flood plain encroachments as a condition for private flood insurance and for construction of federal or federally-assisted flood control projects. However, present federal practice accepts "promises" of future action, which to date has been slow coming about. The sub-committee recommends that the requirement of "prior" implementation be held firm.

3. That the federal, state and local governments undertake at once a program for the acquisition of key lands on the flood plains to safeguard their storage capacities and to provide recreation and open space areas near metropolitan centers. In view of the limited financial capacities of states and local governments, some type of grant-in-aid program from the federal government for this purpose seems important.

4. That in some cases it will be preferable for the above agents to undertake programs to remove existing encroachments where serious danger to life is involved or damages are predictable.

5. That in some instances where existing dams can be modified to provide larger reservoirs for flood control protection, these alternatives be considered in preference to construction of new impoundment structures.

6. That existing protective works be modified to increase protection where necessary and that new protective works be built only if absolutely necessary, all above solutions being considered inadequate.

7. That small watershed programs be scrutinized for integration into overall flood control plans. The sub-committee recommends that action be delayed until more information on ecological impacts is available and can be evaluated.

8. That more emphasis be placed on land management measures: protection of high elevations from development; zoning against development where indicated by climate, slope, geology, or exposure; wise land use practices in forest and farm; and practices to minimize dangers from erosion, pollution, and rapid run-off on land suitable for development.

Commercial Navigation

The sub-committee recommends no further widening or dredging of the commercial channel to Hartford, Connecticut, until such time as a realistic assessment is made of the costs of the project in terms of damage to estuarine life and of environmental quality objectives in general.

## Conclusion

In the last few years there has been a significant shift in the weighting of objectives of national economic development, environmental quality and regional development. This has and is resulting in new guidelines for the planning of water and related land use resources. This sub-committee strongly approves these new guidelines and the new planning principles and criteria that they presuppose.

The proposals for the Early Action Plan of the Connecticut River Basin Comprehensive Study were developed under the prior guidelines of Senate Document 97 and, understandably, only partially reflect the new changes. However, appropriations for proposed projects will be judged in terms of today's political priorities and will presumably have to meet the present requirements set by the National Environmental Policy Act of 1969, as well as future legislation that may be passed.

This sub-committee feels that much information and analysis may be needed before good decisions can be made consistent with environmental quality objectives. In some cases the technique is not available and must be developed. In other cases obvious first phase programs can be started concurrent with further research and study for later phases, i.e. in the sewage treatment-water quality field. However, questionable programs which are very costly or whose results are irreversible should be delayed pending further investigations, i.e. large new flood control impoundments or expanded channel dredging for commercial navigation.

The sub-committee also recognizes that there are important national needs competing for governmental funds. The Early Action Plan is estimated to cost $1.1 billion, excluding power facilities which will be financed in the private sector. In view of the severe financial strains on governmental units at all levels, the sub-committee recommends that available monies be placed in the following action programs: (1) for sewage treatment plant construction; (2) for a working flood plain management program; and (3) for acquisition of key lands for flood plain storage and for potential flood control reservoirs, with combined recreation and open space benefits. Also in this highest priority area, though not requiring significant funding, is a workable implementation mechanism to coordinate programs, to continuously plan and evaluate projects, to foster and conduct research, and to make recommendations on priorities.

Because of the uncertainties concerning the need for new large flood control impoundments, the sub-committee feels that as an immediate priority there should be further study of ecological impacts and long term costs and benefits of the various alternatives. In the interim, localized high flood hazard areas should be protected as necessary by the best one or combination of measures as recommended on pages 11 - 13 of this report.

In addition to flood control, other areas identified by the sub-committee as high priority for further research and study before action include: (1) specific pollution problems; (2) needs for and ecological impacts of flow augmentation; (3) location and appropriate role of groundwater; and (4) diversion of "excess" river water flows, especially of tributaries. Programs on these important problems should receive funding commensurate with their needs. They also need careful coordination to insure communication of findings and utilization of results in the continuing planning and decision making process.

## FINDINGS ON SPECIFIC FLOOD CONTROL AND MULTI-PURPOSE DAMS

### Introduction

In studying the various flood control and multi-purpose projects discussed below, the Citizens Review Committee questions some of the assumptions, methodology, criteria and purported needs as stated in the Coordinating Committee's report. This Committee feels that insufficient weight has been given to the environmental quality objectives in the apparent preference of the report for structural (over non-structural) flood control solutions. The Committee has stated, therefore, as an absolute necessity, the completion of thorough ecological studies before the commencement of new projects.

The Committee has found a lack of clearly delineated alternatives which could be considered for practical application to which the criteria of national efficiency, regional development and environmental quality can be applied. However, the Citizens Review Committee approves the Report's findings on flood plain management and zoning. This Committee, to repeat, "cannot approve the building of flood control reservoirs at the expense of natural lands and waterways in the upper basin as long as the same old development patterns are being allowed in the flood prone lands downstream. This applies equally within a single watershed."

The Citizens Review Committee questions the favorable cost/benefit bases used to justify some of the flood control and multi-purpose dams described below. In some cases, it is felt that the collective benefits may not be compatible. Existing benefits to be lost were not adequately weighed. Long range social, economic and environmental costs and benefits were not taken into account. For instance, no cost/benefit analysis was made to determine what the value of the proposed dams might be if adequate flood plain management, zoning, land acquisition and local flood control alternatives were implemented.

The Citizens Review Committee finds such statements in the Coordinating Committee's report as "upstream storage reduces the acreage that is subject to flooding, thereby reducing the acreage where flood plain zoning is necessary," are inherently incompatible with the further statements that "continuing encroachment on the flood plain (offsets) the gains earned by flood control dams, flood walls, dikes, and associated improvements," (Vol. I, III-8) or "The magnitude of future flood plain damage and loss of life will be determined primarily by the nature and extent of development in the flood plain." (Vol. I, V-71) Because "we can expect flood damage to increase at the same, or a faster rate than we can afford to build new structural controls" (Vol. VII, M-1-56) unless non-structural safeguards are undertaken, the Citizens Review Committee recommends that active programs of flood plain management, zoning, land acquisition and appropriate flood control alternatives be undertaken with all possible haste in all areas of the valley where there exists the possibility of flood damage and/or expansion.

Finally, the Citizens Review Committee feels that the report of the Coordinating Committee does not clearly explain the risks involved which substantiate the need for the enlargement of the existing flood control system by the creation of new multi-purpose or flood control dams. The Committee has questioned the validity of the objective of controlling the remainder of the 25% of the run-off area of the basin above Hartford. It is not clear from the report precisely where damages on the main stem of $10.2 million in Connecticut, $2.8 million in Massachusetts and $6.5 million in Vermont and New Hampshire would be incurred were there a repetition of the flood of record (1936). The report should also make clear what main stem areas, if any, behind local protective works do not have protection against a flood with a flow of almost 25% greater than the flood of record (Vol. VIII, M-1-73).

The Citizens Review Committee believes that rational and pragmatic decisions to protect the social, economic and environmental potential of the valley must be based on a realistic appraisal of the degree of risk involved and the probabilities of occurrence. The projection of the hypothetical Standard Project Flood, which has never been known to occur and whose estimated likelihood of occurrence is less than once in 2,000 years (Vol. II, C-32. Table C-10) makes reasoned decisions tenuous at best.

Victory Dam

Victory Dam has been proposed as a multi-purpose structure for flood control, recreation, low-flow augmentation for downstream fish and wildlife enhancement and hydroelectric power.

Victory is in the Interstate Compact. Its estimated cost is $6.6 million. Its reservoir is planned to contain 24,000 acre feet, equivalent to six inches of rainfall in the drainage area. A recreation pool of 2,880 acres would be created which would be subject to a maximum draw-down of four feet in the summer. Cubic feet/sec. releases would increase from 50 in the summer to 135 cfs in the winter with approximate draw-down of 20 feet.

Victory Dam would require land acquisition of 6,900 acres.

The report states clearly that the dam is not justified for any single purpose mentioned above; only by creating a recreation pool can the project be rationalized. It is not necessary for flood control since the area is a natural, no-cost flood retarder which causes the Moose River to peak after neighboring streams. The report made by Anderson and Nichols for the Vermont Resources Board shows that the dam would reduce flood crests on the Passumpsic primarily, and have very little effect on the Connecticut.

The area already serves an important recreational function. It is prime open space for upland game, and is also suitable for canoeing, hiking in a natural wilderness-like setting.

The Victory site is unique because it comprises a 1,250 wetland complex known as Victory Bog. It is a large and diverse area for breeding and feeding by migratory birds and water fowl. Fishing both below and above the site would not be enhanced by the construction of a dam or low-flow augmentation. The area is used for scientific study because of the swamp's flora and fauna, some of which is extremely rare. It is doubtful if a recreational pool with a four foot draw-down would enhance either fish or wildlife, and flooding would destroy some unusual flora and drive out wildlife which has no where else to go. A good deal of forest would be lost, as well as an interesting historical exhibit consisting of the remains of a logging complex - railroad, building foundations, and dams.

Governor Davis and the Vermont Legislature are both on record opposing this project. They are joined by resolutions in opposition from many civic and conservation organizations.

The Citizens Review Committee recommends that any decision concerning the Victory Dam project be held in abeyance until the priorities and recommendations stated in the Citizens Report for flood plain management, zoning, land acquisition and appropriate alternatives for flood control have been implemented. Concurrent studies should also be undertaken to determine if there is a continuing need for the project in the light of all appropriate alternatives.

Gaysville Dam

Gaysville is a dual purpose structure for flood control and recreation. It is not in the Interstate Compact. Its estimated cost is $31.6 million. The reservoir area is planned to contain 22,800 acre feet, equivalent to six inches of rainfall in the drainage area. A recreation pool of 640 acres would be provided with a draw-down possibility of 20 feet. 3,200 acres would be taken in land acquisition, of which some 1,500 acres would be tillage and dairy land. An equal amount would consist of forest area used for tree farming. 17 miles of roads, houses and other buildings would have to be relocated.

In Vol. VIII (M-1-120) it is stated that this dam would merely increase downstream security during a major flood; it is not claimed that this dam is vital for flood control. The Report also states that the dam would not be satisfactory for low-flow augmentation for the enhancement of fishing (Vol. VIII, M-1-119).

The area of the proposed site is dominated by mountains rising sharply from a rock gorge. Under these circumstances, it is hard to see the value of a small recreational pool which would experience sharp draw-downs. The clean, free-flowing White River presently provides a valuable source of recreation. The cost of the project in money, in lost social values, and in valuable farm land appears to be large when compared with the projected gains in flood control and recreation.

Governor Davis of Vermont, as well as important State Departments and civic organizations, have gone on record as being opposed to the Gaysville project.

The Citizens Review Committee recommends that any decision concerning the Gaysville Dam project be held in abeyance until the priorities and recommendations stated in the Citizens Report for flood plain management, zoning, land acquisition and appropriate alternatives for flood control have been implemented. Concurrent studies should also be undertaken to determine if there is a continuing need for the project in the light of all appropriate alternatives.

Bethlehem Junction Dam

Bethlehem Junction is proposed as a multi-purpose structure for recreation, flood control and incidental low-flow augmentation for the enhancement of downstream fisheries. The estimated cost of the project would be $16.0 million. The project would impound a total of 55,600 acre feet, the equivalent of eight inches of runoff. A pool of 1,090 acres would be created for recreation purposes. Land taking would involve 1,900 acres.

According to the Report, the dam site, although not ideal from a geological standpoint, was selected because it minimized land acquisition and would provide a recreational pool in a suitable location. A single purpose flood control reservoir was found to be economically unjustifiable. (Vol. VIII, M-1-122)

Questions have been raised as to the effect of this dam on the anadromous fish program and spawning areas for other fish on the Ammonoosuc River. The U.S. Bureau of Sports Fisheries objects that the 16 cfs low flow augmentation suggested by the Corps of Engineers is inadequate for fishery enhancement, and the Corps maintains that the cost of increased flow would exceed incremental benefits. The New Hampshire Fish and Game Commission is also opposed to the Bethlehem Junction projects. However, it has been endorsed by all other state resource agencies. The north country is considered to need some flat water recreation capacity. This project is considered by these agencies as important to meet regional development needs.

The Bethlehem Junction Reservoir would be located about equally in the towns of Twin Mountain and Bethlehem. Twin Mountain (pop. 400) opposes the project, while Bethlehem (pop. 1000) in general supports the proposal. Both towns have recreation as their main source of income. A serious decline in the resort activity is evidenced in the area by the many closed hotels and cabin groups. However, some gains have been made recently by motels catering to overnight summer tourists in Twin Mountain on Route 3 upstream of the dam site.

Though the river is a free flowing, attractive white water stream, it is not considered a good productive trout stream at present. The river is used by white-water canoeists, but income from such recreation is low, as most canoeists camp out. The present recreation income from the river at the impoundment site is not considered great.

It is felt that a 1,000 acre summer lake surrounded by the Presidential and Twin Mountain ranges would provide an economic stimulus to the area and would create a quality resort atmosphere which would lead to the institution of town planning through the relocation process.

Flood control for Littleton (pop. 5000) and Lisbon (pop. 1500) is significant as both towns are located on a narrow flood plain. Alternatives such as flood plain zoning or dikes are not considered practical. Alternative dam sites have been studied in detail with no project considered a satisfactory alternative.

It is recommended that planning continue on the project, provided there is a local citizens advisory committee established which could be brought in to advise on all aspects of the project.

Claremont Dam

Claremont is proposed as a multi-purpose dam for flood control and recreation, with future low-flow augmentation planned for water quality by 1990. The Claremont Dam was not part of the Interstate Compact. Its estimated cost would be $20.9 million. The dam would impound 78,400 acre feet of storage in winter and spring, amounting to six inches of runoff. During the summer, a recreation pool of 860 acres would be maintained, subject to a two foot drawdown during dry spells. Otherwise low-flow augmentation would be employed only from Labor Day to about November 1. Winter drawdown would be about fifteen feet.

The Claremont Dam is of doubtful utility for recreational as well as flood control purposes. The Sugar River Small Watershed project currently being implemented with Federal and State monies will create 12 lakes with a surface area of 1199 acres and 27.2 miles of shoreline. In addition to that the project will provide the city of Claremont with protection capable of retaining the 100-year flood.

Pollution abatement, projected by the state of New Hampshire and recommended by the Connecticut River Basin Coordinating Committee, will make this area one of the most realistic potential salmon runs and rainbow trout streams in the western part of the state. Similarly, game cover for bird, deer and other small game would be preserved for recreational purposes were the project abandoned.

Local opposition to the dam is outspoken. Sen. Norris Cotton, Rep. James Cleveland, and Gov. Walter Peterson have all expressed themselves in opposition. The State planning agencies have expressed themselves in favor of the project.

The Citizens Review Committee recommends that because the case for this project is not yet clear, it be restudied for alternative solutions.

Beaver Brook Dam

Located on the Ashuelot River near Keene, N.H., this project has been authorized for multi-purpose development by the Flood Control Act of 13 August 1968 as reported in Sen. Doc. No. 68, 90th Congress, 2nd Session. Preparation of contract plans and specifications is now underway.

This project would provide a recreation pool of 203 acres. 8.6 inches of runoff is allocated to flood control. It is anticipated that the reservoir will be used for water supply by 1990. The cost of the project is estimated to be $1.66 million.

Local response in Keene seems enthusiastic for this project. The area faces a long range water supply problem. The project is also considered to have good conservation features.

Unless more facts are forthcoming, the Citizens Review Committee recommends the completion of the Beaver Brook Dam.

Honey Hill Dam

The Honey Hill project has been designed as a flood control and recreational development, while uses for low-flow augmentation and possible industrial water supply are under consideration. Impounded storage of 31,500 acre-feet would be the equivalent of 8.4 inches of runoff. A recreation pool of 970-680 acres would be provided with a three foot drawdown for low-flow augmentation in the summer months. During the spring runoff, the dam would impound the equivalent of 6 inches of runoff. Land acquisition would amount to 2,070 acres. The estimated cost of the project would be $11.1 million.

Although opinion in the area is divided about the need for more flat water recreation, since there are numerous, well-located lakes in the vicinity, the New Hampshire Parks and Recreation Commission is strongly in favor of this project. It is their opinion that the Honey Hill Dam would provide flat water recreation opportunities to supplement the nearby Pisgah State Park.

The South Branch of the Ashuelot is so badly polluted below the proposed dam site that any foreseeable fishery benefits seem questionable in the near future. Pollution control is, therefore, a major priority.

The area below the dam site consists of flood plains which are currently undeveloped. The large, natural retention possibilities of this area would suggest the need for immediate flood plain zoning. The Report suggests that industrial plants in Hinsdale and Swanzey, which are old and incapable of flood proofing, either be protected by dikes or razed. According to the Report, there are no immediate areas downstream on the main stem of the Connecticut which are threatened by the Ashuelot.

The Citizens Review Committee recommends that because the case for this project is not yet clear, it be restudied for alternative solutions.

Meadow Dam

The Meadow Dam is proposed as a single-purpose flood control dam. It is not part of the Interstate Compact, and though under consideration at various times was dropped from study in 1966 because it could not be economically justified. The dam, the largest flood control structure in New England, would impound 160,400 acre-feet, the equivalent of 8 inches of runoff. There would be no recreation pool and no low flow augmentation benefits. Land taking would result in the loss of 1,650 acres of woodland, state park, dairy and orchards, as well as the relocation of 9 to 10 miles of railway, roads and bridges. Annual average drawdown would be 100 feet. The cost of the project is estimated at $41.4 million.

As pointed out in the Report, "the Deerfield River is an area of outstanding beauty." In the proposed area of the dam and reservoir, the steep banks are heavily wooded for the most part. The stream is heavily fished for trout, and small game, deer and bird abound. State park land along the south side of the river from the dam site to Shelburne Falls makes full recreational use possible. The area is used for environmental studies by the many schools and colleges in the vicinity. Parts of this stretch of the river are used for canoeing and rafting. Several buildings and sites of historical interest would be affected by this project.

Because of the steep topography of the area, it is felt that serious environmental damage would occur. Annual drawdowns of 100 feet, estimated by the Corps of Engineers, would result in the destruction of forests, wetland habitats, with resultant erosion and the destruction of cover and the silting in of fishing pools. Furthermore, the impoundment of water annually for approximately 10 days, up to seven weeks, when the reservoir is full, will exacerbate the damage resulting from severe drawdowns. In order to lessen these effects, it will be necessary to undertake extensive cutting of the forests on either bank.

The beauty of the valley would be further marred by the proposed relocation of the railroad and the construction of a 200 foot high railroad bridge across the Deerfield in full sight of the Stillwater Bridge and Interstate Route 91. Furthermore, the relocation of the tracks along the boundary of the State Park will lessen the attractiveness of the Park's recreational facilities.

The Report states that the Meadow Dam would serve as a major flood control reservoir for the protection of the main stem of the Connecticut, providing protection to urban areas below Montague City for all floods, including the flood of record (1936) and the Standard Project Flood (SPF). However, the Report also states that urban areas south of Montague City are currently protected by existing dams and dikes from any flood 25% in excess of the flood of record (Vol. VIII, M-1-73). The statistical probability of the occurrence of such a flood is less than 1 in 400 years (Vol. II, C-32). Were a 1936-type flood to reoccur, the Meadow Dam might be expected to prevent property damage valued at $2.8 million in Massachusetts and $10.2 million in Connecticut. This would not seem to justify the expenditure of $41.4 million on the Meadow Dam.

The argument that the Meadow Dam is designed to protect against a Standard Project Flood (SPF) raises many unanswered, and perhaps unanswerable questions due to the hypothetical nature of the SPF. However, table C-10 (Vol. II, C-32) presents the statistical probability for a flood generating 375,000 cfs at Montague City as having a frequency of once in 2,000 years. According to the estimates, a SPF would generate a flow of 398,000 cfs at Montague City, or 23,000 cfs greater than the once-in-2000-year flood.

In spite of the remote possibility of the SPF, two questions remain concerning the ability of the Meadow Dam to cope with such a flood: (1) Since the Meadow Dam would be topped in less than 38 hours in any flood greater than 1936, how could it provide protection from an SPF originating in the Connecticut Valley to the north? (2) Since the Deerfield River almost invariably peaks 24 hours before the Connecticut crests, would not the overtopped Meadow Dam contribute substantially to flood damage in the Connecticut downstream?

The Report offers as an alternative to the Meadow Dam the heightening of protective works where they already exist, with the exception of Hartford which has dike protection against an SPF. This would require the addition of 3 to 5 feet in most instances.

Opposition to the Meadow Dam is widespread. Both Rep. Silvio Conte and State Rep. Jonathan Healy have expressed their opposition to the project. County, State Departments, and local elected officials have registered their opposition. Local and National conservation associations have expressed their disapproval of the Meadow Dam.

The Citizens Review Committee recommends that any decision concerning the Meadow Dam project be held in abeyance until the priorities and recommendations stated in the Citizens Report for flood plain management, zoning, land acquisition and appropriate alternatives for flood control have been implemented. Concurrent studies should also be undertaken to determine if there is a continuing need for the project in the light of all appropriate alternatives.

Tully Brook Reservoir

Tully Reservoir is an existing single-purpose flood control project. It is recommended in the Report that a recreation pool of 650 acres be created immediately, in anticipation that by 1990 this pool will be used for water diversion to Quabbin Reservoir. Should additional water demands develop, secondary supply reservoirs would be constructed on Priest and Tarbell Brooks for diversion to Tully and then to Quabbin. The initial estimated cost of the project for the Tully Brook Reservoir is $18.7 million.

Major concerns have developed over the advisability of (1) altering the flow regime into the Millers River which is badly polluted and (2) diverting "excess" flows to Quabbin Reservoir. Of immediate concern is the effect which this reservoir would have in denying flows which would enhance the effectiveness of the new Athol sewage treatment plant immediately below the confluence of the Tully with the Millers River. A second question of importance would be the effect of on the ground water supply in the Tully River Basin from which Athol is currently drawing its municipal water supply and is contemplating future use through a second well a half mile upstream of the site.

It would appear that the area of greatest concern is the quantitative impact of the proposed flood skimming on the various streams involved. Presumably the environmental and social impact would be substantial.

The Citizens Review Committee recommends that an in-depth study be made as to the ecological, social and economic effects on the area of the diversion of excess flows before any further action is taken.

Gardner Dam

Gardner Dam is proposed as an alternative project for flow augmentation to enhance water quality. The pool would provide 12,500 acre-feet of storage, 9,500 for flow augmentation and 3,000 for a warm-water lake fishery. Storage capacity could raise the Otter River to Class C, and assist the Millers River to attain Class B. Land acquisition would involve 1,030 acres. Estimated cost of the project would be $4.07 million.

According to the Report the Gardner site is being retained as an alternate proposal to advanced treatment methods.

The Citizens Review Committee recommends that all steps for pollution control be given priority before the dam.

MINORITY VIEWS

Richard Brett
Emery Evans
Victor Gagnon
Ellsworth Grant
D. Day Lee
Joseph Niquette
Warren Sinclair

Georgie Williamson concurring with respect to Victory and Meadow dams only; Florence Carver concurring with respect to Meadow dam only; Allie Quinn concurring with respect to Victory dam only.

We, the above, wish to indicate our opposition to the Victory Dam, the Gaysville Dam and the Meadow Dam. We would like to recommend that the Gaysville and Meadow projects, heretofore not included in the Interstate Compact, together with Victory, be withdrawn from consideration in the report of the Connecticut River Basin Coordinating Committee.

The arguments against Victory and Gaysville are summarized as follows:

1. The comprehensive Water and Related Land Resources Investigation fails to prove that either Gaysville or Victory dams are important primarily for flood control. In fact, the report shows that neither is justified in terms of flood control alone.

2. Any examination of purposes will show that water based recreation, flood control, and low flow augmentation are mutually exculsive objectives.

3. The Victory area is a unique wetlands complex providing no-cost flood protection as well as a wide variety of recreational and scientific values which are not compatible with the proposed structure.

4. The Gaysville site contains scarce and good agricultural land. The steep sided valley is not suited to mass water-based recreation. It is not good economics to trade productive agricultural soil for a recreational area of doubtful promise.

5. Vermont is asked to sacrifice a unique area and scarce farm land for an unproven purpose. The cost in social, economic, ecological and esthetic terms is not justified so long as alternative protective measures such as flood plain management and more efficient dikes are available. The money spent on Victory and Gaysville could well provide local protective devices.

6. The Governor of Vermont, its legislature, and many civic organizations have registered total opposition to both projects.

The arguments against the Meadow project are summarized as follows:

1. The Meadow project, as a single-purpose flood control dam, would do irreparable harm to one of western Massachusetts' most beautiful and historic rivers, the Deerfield. The valley, inundated to a depth annually of 100 feet, would find its woodlands destroyed, its wetland habitats washed out, and the patterns for fish and wildlife drastically altered.

2. Recreational facilities, presently extending from the proposed site to Sherburne Falls, eight miles upstream, would cease to attract the fisherman, hunter, hiker and students who constantly use the area, because of the altered conditions of the river and surrounding banks.

3. The esthetic qualities of the area would be further marred by the construction of a 200 foot high railroad bridge below the dam and the rerouting of the tracks along the perimeter of the South River State Park mentioned above.

4. Significant holding times will occur during spring impoundments annually and excessive holding times will occur on an average of once every five years. Holding times of ten days to five weeks will cause severe environmental damage.

5. The Meadow Dam is not necessary as a flood control measure to inhibit a flow equal to any experienced flood. Urban areas on the main stem behind protective dikes are protected up to 25% beyond the flood of record. Alternative measures of flood plain zoning, management, land acquisition and possible addition or modification of protective works are realistic provisions for all floods up to a Standard Project Flood.

6. The utility of the Meadow project as a flood control measure should be questioned. Because of the topography of the valley, the Meadow Dam would be topped in approximately 38 hours if a flood of record were to reoccur. Furthermore, the Deerfield historically peaks about 24 hours before the Connecticut. Thus in the hypothetical Standard Project Flood, the river would overflow the Meadow Dam and contribute to the peak of the Connecticut, rather than passing downstream, with little harm, before it.

7. The Standard Project Flood as a measure of need for the Meadow Dam is such an imprecise and hypothetical guide as to make its use as a decision making tool doubtful.

8. The economic argument that the Meadow Dam would prevent $13.0 million damage if a flood of record were to reoccur is not a convincing argument for spending $41.4 million for the Meadow Dam.

One is led to believe that the purpose of the flood control system proposed in the report of the Connecticut River Basin Coordinating Committee is to provide total regulation of the Connecticut River to allow for economic expansion on the flood plains. The degree of regulation suggested would, indeed, if it were possible, encourage the development of the flood plain beyond those areas which are presently protected by local protection works, and in the process, would increase the damage potential of the Connecticut River Basin. This increased damage potential would eventually provide the basis for subsequent proposals for additional storage reservoirs which will lead to further environmental damage. Such a policy would be self-defeating.

We are opposed to Victory Dam, Gaysville Dam and Meadow Dam for all of the above reasons.

## APPENDIX TO THE MINORITY REPORT

### Victory Dam

A proposed multi-purpose reservoir on the Moose River, Victory, Essex Co., Vermont. Purpose: Storage for flood control, recreation, downstream hydroelectric power, and fish and wildlife enhancement resulting from low flow augmentation. The dam would be 90 feet high and 930 feet long with an available 2880 acre recreation pool and 52,000 acre feet of flood storage. The dam would require land acquisition of 5800 acres. Total first cost is estimated at $6.6 million. It should be noted, however, that for flood control purposes the impoundment will contain 24,000 acre feet, equivalent to six inches of run-off from the drainage area.

There are two arguments against the Victory Dam: one is environmental and the other is essentially economic. Concerning the former, the Report of the CRBCC is notably deficient.

The Victory site is unique because it comprises a 1250 acre wetland complex known as Victory Bog on the Moose River. It consists of a variety of wetlands, streams, ponds, hardwood knolls, and northern spruce-fir forests forming a continuous mosaic tied together by the Moose River. It is surrounded by a ring of mountains which create a beautiful, natural wilderness-like setting. It provides a natural habitat for animals and plants. It is a large and diverse area for breeding and feeding by migratory birds and water fowl. The nature of these wetlands makes them function as a great sponge - a natural storage and control reservoir for water. Victory Bog is utilized by sportsmen and nature lovers and serves as an outdoor classroom and natural history laboratory for educational uses.

Available scientific and objective evidence indicates that building a dam would not achieve significant flood control nor would the artificial lake thus created be a recreational area utilized sufficiently to justify the expenditures involved. The artificial lake would function only as a marginal fishery and low flow augmentation releases from the lake would be a negligible contribution to improved fishing on the main stem of the Connecticut. To dam the area and create an artificial lake would forever destroy the diverse natural features and eliminate the multiplicity of wildlife now living in this area.

The report of the CRBCC points out that "a single purpose development of the site would not be economically feasible and would inadequately develop the resources of the area. Hydroelectric power and low flow augmentation for water quality are not justified either as a single purpose development or in combination with one another." (VIII, M-1-117) Because of this a multi-purpose dam has been devised providing recreation and flood control. The Northeast Kingdom needs the development of tourist and recreational facilities on a quality basis. Fishing and hunting can best be promoted by retaining Victory wetlands in its natural state as it is now a major supplier of fish and wildlife. Water-based recreation activity could best and most inexpensively be developed by providing facilities on the existing Moore and Comerford Reservoirs where impoundments exist without the expenditure of $6.6 million.

It can be pointed out here that a multi-purpose dam is a compromise structure. A varying shore line is not suitable for wildlife and/or recreation. An empty reservoir is no good for low flow augmentation. A full reservoir is not good for flood control.

A major justification for building a reservoir at Victory is that it would mitigate flood losses "locally and regionally." The report made by Anderson and Nichols for the Vermont Resources Board shows that the dam at Victory would reduce flood crests on the Passumpsic primarily, and have very little effect on the Connecticut. The reason for this is that the Bog already acts as an automatic flood control device. The Moose River has not been known to have suffered large-scale floods. "Flood plain zoning and management will prevent the situation from worsening," (VIII, M-1-104) and according to the Report of the CRBCC, Victory Dam is not justified for flood control purposes only.

If flood plain zoning were included in the Connecticut River Basin Coordinated Plan as an immediate priority for implementation, it would greatly reduce the need for big dams, and in the case of Victory, it would largely negate the cost-benefit analysis.

In considering the matter of recreation, it is interesting to note that this land is prime for upland game, and in fact is suitable for all outdoor recreation. If one grants the notion that recreation has many forms from mass recreation to solitary types, this is a fine place for hunting, fishing, hiking and so on. It is also useful as open space and valuable as an outdoor laboratory because of its varied habitat and swamps. According to Paul M. Reed, Forester for Caledonia Co., ret., "This bog has many rare and semi-rare orchids.... All the wildlife we have in northern Vermont is found there.... There are a few moose.... Three of us have seen cougar here.... The cover, food and general habitat is about perfect for wildlife and if flooded there is no place just like it for the game to go."

As pointed out above additional water-based recreation could be achieved at virtually no cost by the utilization of Moore and Comerford Reservoirs. Additional water-based recreation areas can be developed, as reported in the International Joint Commission study, on Lake Champlain in Addison Co., Chittenden Co., and Franklin Co. for little more than the cost of the Victory Dam. In fact, it appears that Vermont could get approximately five times more recreation facilities if dam construction monies were spent on development of existing bodies of water rather than on new facilities which at the same time would drown out recreational activities.

The Report of the CRBCC states that releases of water from Victory would be to enhance fishing through low flow augmentation and to provide "releases for downstream hydroelectric power facilities." (I, VII-27) Low flow augmentation resulting from the Moose for the amelioration of effluents on the main stem will be of negligible effect compared to the .20 cfs per square mile to be required of existing power dams.* With regard to fishing, the rationale for upsetting fishing areas and habitats on the Moose River in order to improve fishing downstream seems to be missing due to the negligible effect releases from Victory would have on downstream volume and temperature. Again, the .20 cfs/sq. mile release of existing dams should adequately serve this purpose. Finally, "the release for downstream hydro-electric power facilities" should be seriously questioned from a practical as well as legal viewpoint of benefitting special economic interests at the expense of the environment and the general population.

State goals developed over the past six years have placed great emphasis on preserving, protecting and safeguarding Vermont's greatest asset - its natural resources of scenery and wildlife, hunting and fishing, and outdoor habitat for man. Leadership in this has been provided by Gov. Davis, who is opposed to Victory Dam, and citizens' groups such as the Vermont Fish and Wildlife Review Panel, the Green Mountain Audubon Society, the Green Mountain Chapter of the Society of American Foresters, the Vermont Natural Resources Council, the Vermont Federation of Sportsmen's Clubs, and the Federated Garden Clubs of Vermont. All have gone on record in opposition to Victory Dam. In addition to that the Vermont Legislature has passed a resolution against the dam.

*To supplement stream flow by building dams without first requiring power companies to maintain a minimum stream flow makes as little sense as controlling floods by building dams without zoning flood plains. To construct new dams to supplement stream flows which will benefit hydro-electric plants which may be required to establish .20 cfs/sq. mile minimum flows is robbing Peter to pay Paul.

Gaysville Dam

The Gaysville Reservoir project is to be located on the White River 0.5 miles from the village of Gaysville and 31.6 miles from the confluence with the Connecticut. The dam would be 775 feet long and 190 feet high. A dike 900 feet long and 80 feet high would be required to close a saddle adjacent to the abutment of the dam. The dam is proposed as a dual purpose dam for flood control and recreation. It would provide a recreation pool of 640 acres. Land acquisition would involve 3200 acres, 40% of which is classified as wooded and used for tree farming; 31% for tillage; 13% for dairy; 4% residential; 7% roads and water and the rest developable. The total cost of the project is estimated at $31.6 million.

Gaysville Dam is not in the Interstate Compact. It is not satisfactory for low flow augmentation for fishery enhancement at any time other than the winter-spring floods. As stated by the report of the CRBCC, "low flow augmentation releases at other times of year for water quality or fish and wildlife habitat are either not warranted or economically unjustified." (VIII, M-1-119)

The area of the proposed site is dominated by hillsides and mountains rising sharply from the narrow river valley. The area borders on the Green Mountain National Forest to the west with numerous peaks rising to elevations of over 3000 feet. At the proposed site of the dam, the White River flows through a rock gorge. This is a uniquely rustic and beautiful area with a clean free flowing river which should be protected as such. It already provides a small recreation pool with very steep banks and a draw down possibility of 20 feet. It would not in any way enhance the fishing, but to the contrary would alter its characteristics radically.

Part of the attractiveness of the New England scene, epitomized in this area, is its varied mosaic of farmland, dairy and woodlands. For a dam whose effect would only result in a decrease of one foot in flood peak at Vernon should a major flood like 1938 reoccur, the area is losing 3200 acres.

The people of Vermont are opposed to this dam, as are many persons and groups outside of the state. Governor Davis has gone on public record as opposed to the construction of the dams at Gaysville and Victory. The Director of the Vermont Interagency Committee on Natural Resources has also expressed the Committee's opposition to these two dams. The Addison Co. Regional Planning Commission has expressed its opposition to both the Gaysville and Victory Projects. The Vermont State Farm Bureau expressed the disbelief that the total benefits derived would be equal to the adverse effects created by the flooding of good farm land at Gaysville. The Appalachian Mountain Club also expressed its opposition.

Meadow Dam

The Meadow Dam has never been part of the Interstate Compact and was withdrawn in 1966 from consideration. It has been reinstated in the Report of the CRBCC as a single-purpose flood control dam, 2650 feet long and 260 feet high. The Dam would be located on the Deerfield River 1.4 miles above the Stillwater bridge and approximately 2.5 miles above the town of Old Deerfield. Land taking would result in the acquisition of 1900 acres extending into the town of Shelburne Falls 8 miles to the west. About 1650 acres is heavily wooded and the remainder is in dairy land and orchards. The impoundment of 160,400 acre-feet would control 8 inches of run-off.

The argument of the U.S. Army Corps of Engineers in favor of the dam is that it would serve as a major flood control reservoir for the protection of the main stem of the Connecticut, protecting urban areas below Montague City, Massachusetts from flood 25% in excess of the flood of record (1936) up to a Standard Project Flood (SPF).

As pointed out in the Report of the CRBCC, "the Deerfield River is an area of outstanding beauty." (VIII, M-1-132) The steep banks are heavily wooded for the most part, giving way on the hilltops to farms and orchards. The stream is heavily fished for trout, and in season small game and bird abound. State parkland along the south side of the river from the proposed dam site to Shelburne Falls gives access to the river and makes full recreational use possible. The area is used for environmental studies by schools and colleges in the vicinity (of which there are a great many). Parts of this stretch of the river are used for canoeing and rafting.

Were the dam to be built, it is felt that serious environmental damage would occur. According to the Corps of Engineers estimates, the reservoir would be filled annually to a depth of 100 feet and their projection is that every 50 years the maximum impoundment would be attained (260 feet and 1900 acres in area). They also estimate a 100 foot drawdown in "a few days." Such a situation would result in the destruction of forests, wetland habitats and erosion due to the excessively steep banks along the river. The pattern for wildlife, game and bird will be seriously altered. It is believed that impoundment of water in excess of 10 days will seriously change the fishing potential of the river, and the Massachusetts Department of Fisheries and Game has stated that under those circumstances they would cease stocking that stretch of the river. Advice from botanists at the University of Massachusetts have substantiated the opinion concerning other forms of life in the area. The representation of the Corps of Engineers that the Meadow Dam will help to restore salmon fishing in the Deerfield River is a misrepresentation; the Department of Fisheries and Game has stated that any anadromous fish found in the Deerfield would be purely accidental.

The environment of the area would be further changed by the removal of acres of top soil, gravel and rock for the construction of the dam and by the cutting back of trees up the banks of the stream to prevent clogging. This will hasten erosion and result in the silting in of trout pools and the destruction of natural food and cover.

We share the belief along with that of the Division of Fisheries and Game when they state that "it probably will be only a matter of time before this single-purpose site is converted to a multi-purpose site and again eliminating a significant stretch of free-flowing stream exactly as in the case of Knightville." Were this to happen, the ecological damage would be even more severe.

The beauty of the valley would be further marred by the rerouting of the Boston and Maine Railroad from the north to the south side of the river. This will require at the cost of $15.7 million, the construction of a railroad bridge approximately 200 feet above the river at West Deerfield, in full sight of the Stillwater Bridge and Route 91. Furthermore, rerouting on the south side will destroy the beauty of the State Park along which it will run.

The Deerfield River Valley is a historic valley and part of America's heritage. Not only are there the old stone walls dating back before the Revolution and lovely unspoiled dirt roads, but ancient barns and homesteads which would be sadly affected by the construction of the Meadow Dam.

From an economic point of view, the Meadow Dam's necessity does not appear clear. In 1966 the dam was not in the program of the CRBCC, but in 1969 it reappeared with the statement by the Corps of Engineers that it appeared economically justified with the recomputation of cost/benefit factors. Cost/benefit analysis procedure is an excellent method of appraising a project when the analysis is conducted by a team of objective experts. However, when such analysis is conducted by the same agency which has an interest in building the dam, it is both natural and unavoidable that such analysis, based on many arbitrary assumptions, would tend to favor the desired outcome. For instance, it would appear that population projections, upon which the economic studies of Arthur D. Little, Inc. and the water resources study of the Office of Business Economics were made, had to be revised sharply downward half way through the study of the CRBCC. This does not seem to be reflected, however, in the cost/benefit analysis made for the seven major dams under consideration. In addition to that, in computing cost benefits, it does not appear that realistic benefits were attributed to the enactment of adequate flood plain zoning. No assessment was made of the cost of flood plain zoning versus dam construction during the course of the CRBCC study.

It does not appear clear that the construction of a $41.1 million dam on the Deerfield River economically justifies itself for the protection of property valued at 2.8 million dollars in Massachusetts and $10.2 million in Connecticut on the main stem, were there to be a recurrence of the flood of record. The Meadow Dam does not appear to have any economic advantage on balance in the Deerfield River Valley itself.

The Report of the CRBCC has not made it clear beyond the shadow of a doubt that there is a necessity for the Meadow Dam. As the Report points out, the existing protective works on the Connecticut and the existing dams now protect from a flood 25% in excess of the flood of record. According to Table C-10 (Vol. II, C-32) the probabilities of this are less than one in 400 years. The Meadow Dam would only be of real value for a flood of greater magnitude - up to a Standard Project Flood (SPF).

The SPF is a purely hypothetical flood. It assumes a sequence of events which would have to occur simultaneously in a given area, but which in fact have never occurred simultaneously in any part of the valley. It is estimated that such a flood would generate 398,000 cfs at Montague City. Looking again at table C-10, we see that such a flow is not tabulated, but that the nearest flow of 375,000 is attributed a frequency of once in 2000 years. Such statistical projections are of dubious validity, but it rests with the Corps to give reasonable proof that such a flood might occur in a reasonable time, and that the structures designed to contain it, would in fact do so.

Questions arise concerning the performance of the Meadow Dam which are at variance with the report of the CRBCC. Calculations made with the assistance of the University of Massachusetts (Dr. Frank Kaminsky) indicate that were a 1936 flood to reoccur on the Deerfield, the Meadow Dam would be topped in 38 hours at a time just before the Connecticut's peak at Montague City, thus contributing to the flood on the main stem. Secondly, impoundment times have been recomputed for the Deerfield for various flood years, and they have been found to exceed three weeks to seven weeks. In non-flood years holding times have been shown to be greater than a week. In every case it was shown that excessive holding times will result from storms which are likely to occur.

The Corps of Engineers offers as an alternative to the Meadow Dam, the heightening of protective works where they already exist below Montague City (with the exception of Hartford). The addition of three to five feet would provide protection against the STP. As recently stated by the Commission of the Department of Natural Resources of the State of Massachusetts, perhaps we should spend a little more by electing this feasible alternative in order to protect the environment in the Deerfield River Valley.

Opposition to the Meadow Dam is widespread. Petitions taken in the area indicate that over 3000 people are opposed to the dam. The selectmen of the four townships involved have gone on record against the dam, as well as the county commissioners. The conservation districts and the farm bureau have indicated their opposition. Rep. Silvio Conte (R-Mass.) and Rep. Johnathan Healy have both come out against the dam. Organizations which have taken a strong position opposed are The Connecticut River Watershed Council, the Massachusetts Audubon Society, the Sierra Club, the Council on Environmental Quality, and the Deerfield River Valley Conservation Association.

# REPORT OF THE SUBCOMMITTEE ON RECREATION, ANADROMOUS FISHERIES, RESIDENT FISH AND WILDLIFE, AND PRESERVATION OF ARCHEOLOGICAL SITES

Mrs. Florence Carver, Chairman
Clyde Fisher, Jr.
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Joseph Niquette
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John Wilson

The sub-committee was generally impressed with the attention given its four areas of concern in the Connecticut River Basin Investigation. It believes that the Early Action Plan makes satisfactory provision for Basin needs relating to the latter three of these areas. The Early Action Plan also includes a number of important proposals for recreation development, but in this area the sub-committee believes the Plan should be expanded considerably. The recreation values that can and should be realized in the Basin over the years ahead go well beyond those recognized by the Plan, as do the range of development activities underway and proposals under study in the Basin, especially on the State and local level. For this reason, this report deals primarily with the recreation element of the Early Action Plan.

## Recreation

The sub-committee endorses the Coordinating Committe's emphasis on the expansion of facilities and improved access at existing water bodies (Vol. 1, Summary, p. IX) The Basin's extensive recreation opportunities relate principally to existing water bodies, as is recognized by the proposed Connecticut River National Recreation Area, which is properly accorded a central billing in the Plan's recreation element. Although the components of the National Recreation Area would meet many recreation needs, however, a variety of additional actions will be required in a "comprehensive water and related land resources investigation" if recreation needs are to be sufficiently met, especially in or near the Basin's metropolitan areas. The Investigation has given only passing comment to urban recreation needs, without even dealing with the improvement of urban water bodies, and it fails to give important impetus to some existing and emerging proposals for development of new recreation facilities in or near the metropolitan areas of the lower basin.

In accordance with an initial emphasis upon the better use of existing water bodies, the sub-committee would group together and present the following recommendations to the full Citizens Review Committee with regard to the recreation element of the Early Action Plan:

1. Full implementation of the National Recreation Area proposal by a combination of Federal, State and local action as recommended by the Coordinating Committee and the appointment of an officially established advisory committee for the COOS unit, similar to the ones existing in Massachusetts and Connecticut.

2. Accelerated development of water and related land recreation resources in or near the metropolitan areas of the lower basin, again by a combination of Federal, State and local action. Specific opportunities and proposals can be found in the SCORPs (State Comprehensive Outdoor Recreation Plans) and other State planning reports for Massachusetts and Connecticut and in the plans of the regional planning agencies of the lower basin. In Connecticut, for example, a major new state park is contemplated along the Scantic River, there are important recreation opportunities at Rainbow Dam on the Farmington River, and similar opportunities are being examined along the Hockanum and Mattabasset Rivers. The Early Action Plan does recommend new recreation lakes by construction of Cold Brook and Blackledge Dams in the Connecticut portion of the basin, but the cost-benefit ratios of these dams (particularly the $18 million cost of Blackledge) must be weighed against the possibly much greater benefits that could be obtained through the investment of such funds in alternative recreation proposals in the lower basin. The Early Action Plan should be expanded with regard to such possibilities. It should also be expanded with regard to opportunities for increased recreation use of the water and shores of the main stem and other existing water bodies within the urban centers of the lower basin.

3. Increased attention to opportunities for recreation via development of picnic and camping areas and hostels generally along the main stem and also many tributaries, by State and local and private efforts, as well as the use of abandoned roads and railroad rights-of-way for trail systems, hiking, bicycling, horseback riding, etc. along watercourses and elsewhere in the basin.

4. Recreation areas be zoned; i.e., fishing sites removed from swimming areas, time of day scheduled, and these areas be strictly controlled.

5. Improvement of water qualtiy by construction of waste treatment facilities to meet approved State water quality standards, as recommended by the Coordinating Committee.

6. Possible increased use (such as shore fishing, hiking, and nature study)of some secondary water supply reservoirs and lands. The possibility of water contact sports should be investigated in the long range plan, requiring a modification of some state laws to remove liability from water supply engineers.

All uses of any public water supply should abide by regulations of the American Waterworks Association.

7. Increased public access to public water bodies, as recommended in the form of steambank acquisition for fishing in the Early Action Plan, and further as necessary to provide water-related recreation areas. This program should be accorded an especially early priority in order to secure the necessary property rights before waste treatment programs and other public investments inflate the value of those rights. In addition to acquisition of undeveloped areas for this purpose, efforts should be made to acquire the sites of old mills and other industrial buildings being abandoned at often scenic and centrally located spots along streams. Further opportunities for access to public waters should be pursued across power company lands, and these lands may themselves afford recreation opportunities along the line of those just mentioned in connection with public water supply lands.

8. Recreation navigation improvements on the main stem behind the Holyoke, Turners Falls, Vernon and Bellows Falls power dams, as recommended by the Coordinating Committee.

9. Re-regulation of flows at existing impoundments to secure minimum flows of <u>at least</u> the 0.2 cubic feet per second per square mile of drainage area recommended by the Coordinating Committee as a condition to relicensing of Wilder, Bellows Falls, Vernon and Turners Falls power dams. This standard should be applied generally throughout the basin, and further study should be made of the specific costs and benefits of a higher standard in some or all cases. In addition, releases from some impoundments should be required on a planned basis for specialized recreation uses such as canoeing.

10. Creation by each state of a scenic river program, as recommended by the Coordinating Committee, and on an early-priority basis to preserve remaining reaches of river identified as wild scenic or recreational.

In addition to the foregoing recommendations, the sub-committee wishes to emphasize the recreation opportunities offered by flood plains that should be protected against development for flood control reasons. Because of the importance of that protection, and the resulting opportunities for recreation, the sub-committee submits a major further recommendation as follows:

11. Flood plains should be protected by appropriate combinations of State-established zoning and encroachment lines, expecially along the 200 miles of the main stem from Saybrook to White River Junction recommended for flood plain zoning by the Coordinating Committee. The taking of such protective actions by the States themselves should be a condition to the further expenditure of Federal funds for major flood-control impoundments. Moreover, Federal law should be amended to permit the use of Federal funds for acquisition of flood plains for flood storage purposes (and supplemental recreation uses) in lieu of, or as complementary to, additional major flood-control impoundments. Such acquisition should be done where necessary protection by zoning and encroachment lines would exceed constitutional limitations, and also where intensive development pressures could be mitigated by acquisition of strategically located parcels or strips of land.

Further, the sub-committee recognizes the definite recreation values that can be achieved in connection with major flood-control impoundments, although these values would probably never provide adequate justification in themselves for such impoundments. The sub-committee is not in a position to evaluate the specific benefits ascribed to the new impoundments recommended by the Coordinating Committee, nor has it been able to evaluate adequately the over-all arguments for and against such impoundments.

"Fish and Wildlife" Vol. V, page G-60 does mention some additional benefits such as swimming, hiking, bird-watching, boating, nature study, picnicking, camping, etc., while "Outdoor Recreation" Vol. V, page H-59 states that participation estimates have been made for swimming, boating, picnicking, and camping; yet no values for cost/benefit assessment seem to have been given to such activities as

hiking, bird watching, nature study as well as other possible recreational activities related to esthetics and the environment. Supplement I of Senate Document 97 does place a relatively higher benefit value per recreation day for Natural Environment Areas at $2.50, while General Outdoor Recreation is given $2.00, and High Density Recreation $1.50.

> 12. All appropriate steps should be taken, on a high-priority basis, to preserve for possible future use the sites that yet remain for major new flood-control impoundments in the basin. Until such time, if ever, as the need for construction of the impoundments is satisfactorily demonstrated, any land acquired for such site preservation purposes should be put to recreation use.

The sub-committee recognizes the value of recreational navigation, especially on the main stem in the lower basin, but has some reservations concerning the scale or priority of the proposed $7 million recreational navigation improvements between Hartford and Holyoke. Adequate comment on this proposal is not possible in the absence of more detailed study than the Coordinating Committee or others appear to have given it to date. Thus, the sub-committee can only recommend as follows at this time:

> 13. The Hartford-to-Holyoke recreational navigation improvement requires considerably further study before inclusion in the Early Action Plan. Such study should, among other things, consider the integration of any such improvement with the important proposals of the Connecticut River National Recreation Area for preservation of the Windsor Locks Canal and increase of public access and recreation areas along this reach of the main stem. Alternatives to the full-scale improvement presently proposed by the Coordinating Committee must also be examined in order to determine whether only a portion of this 32-mile reach should be so improved in the Early Action period, and also to determine whether any of the reach should be improved at this time in light of possibly higher recreation benefits available from the same investment of public funds elsewhere in the lower basin.

## Whitewater Canoeing

The sub-committee recommends two pilot projects in order to determine if certain techniques can be used to improve river conditions for whitewater canoeing.

First, a pilot project to explore new ways of conserving water for recreation uses through stream bed improvements. It is recommended that a well-defined, short stretch of rapids below a dam having stream flow augmentation capabilities be selected for the study. The principal focus of the pilot project would be to research and find techniques in stream bed improvements designed to create a tumbling course with deep pools and a well-defined narrow channel suitable for both canoeing and fishing. The study could also determine the optimum techniques in managing stream flow releases which would be compatible both for whitewater canoeists and fishermen.

It might be possible to develop a study using model techniques and thereby increase the number of alternatives available which could be studied. A model is being used in the designing of the 1972 Olympic whitewater racecourse at Munich, Germany.

It should be noted that stream bed improvements have been successfully carried out on the Connecticut River in Pittsburg below the First Connecticut Lake. The project was financed by the New England Electric Company and supervised by the New Hampshire Fish and Game Department. The problems were that during periods of low flow the release from the dam was 12 cubic feet per second. This amount of water spread out over the 100 foot wide stream bed which had no well-defined channel. The result was that the river was too shallow for good fishing. The stream bed improvements included bulldozing, the use of gabions and log pyramid deflectors pinned to the river bottom. The work created a low flow channel of sufficient depth to provide for fishing and resulted in good fishing during the low flow period which benefitted all parties involved - the power interests, the lake interests and the stream fishermen. The project was carefully selected, planned and supervised so that there have been no erosion problems from disturbing the river bed bottom. During periods of normal flow it is difficult to determine if any work has been done on the river bed by the casual observer.

It is felt that similar techniques to this could be used in other streams to improve both fishing and canoeing while at the same time conserving the amount of water necessary to augment the streams for recreation purposes during low flow periods.

This type of work should not be confused with channel improvements which are often crises projects in order to alleviate potential serious flood conditions. There is also considerable channel improvement activities done by the State Highway Departments in order to protect the highways and to reduce construction costs. These channels usually result in altering a free-flowing stream into an unesthetic ditch, exposing great amounts of rock and earth. The result is a wide, flat channel which is usually detrimental to canoeing and to fishing.

The second pilot project would be to see if it were possible to construct a canoe pipe through a large dry dam, or to use existing discharge pipes with necessary improvements at the discharge end so it would not endanger canoeists who go through the pipe. Large dry dams present problems to the canoeist as it is necessary to carry canoes over the dam. If the dam is over 100 feet high, this involves considerable exertion whereas a canoe pipe might lead to an exciting new aspect of the trip.

It is difficult for canoeists planning trips to determine what the stream flow will be. Though stream flow information is available at the U.S. Geologic Survey Office in Boston, most canoeists are not aware of this fact.

The problem is acute if canoe runs are planned on rivers controlled by hydroelectric dams. Most of these rivers are entirely controlled by the demand for electricity. Though gatekeepers will give out information regarding the rate of flow at the time of telephoning, no predictions are made about future releases. The uncertainty of water release below hydro projects seriously curtails use of many fine whitewater runs.

It is felt that whitewater canoeing will continue to grow rapidly as a sport. The number of good whitewater runs available in the summer and fall is very limited. It is urged that more channels of communications be established between whitewater canoe organizations and the appropriate agencies controlling the Connecticut River and its tributaries.

Recommended Pilot Projects:

1. To manage a reach of a tributary for intensive use by fishermen and canoeists through stream flow management, stream bed improvement, improved access, intensive stocking, etc.

2. A canoe pipe through a large dry dam.

Recommended Additional Recreation Rivers:

1. Main stem - Pittsburg to Beecher Falls
2. Main stem - Colebrook to North Stratford

Stream Bed Improvement for Canoeing:

1. Need to research activities in Europe in this field.

Streamflow Releases:

1. Growth of whitewater canoeing will require streamflow augmentation in order to meet demand.

2. Amount of streamflow augmentation can be sharply reduced by streambed improvements.

Coordination:

1. Need more contacts with active whitewater canoeists in order to determine programs of water management on the tributaries.

Anadromous Fisheries; Resident Fish and Wildlife

The sub-committee is pleased with the careful consideration given to the anadromous fisheries and resident fish and wildlife matters in the Investigation, and the recommendations concerning them in the Early Action Plan. Without in any way meaning to limit its endorsement to Plan elements mentioned here, the sub-committee wishes to emphasize that many of its foregoing recommendations concerning recreation apply here as well (e.g., those relating to water quality, public access, re-regulation of flows) and that the following additional matters warrant special attention:

1. Fish ladders or other devices should be installed where necessary to permit a capacity of at least one million fish per year at Holyoke dam and of appropriate lesser numbers of fish at Turners Falls, Vernon, Bellows Falls, Wilder and Rainbow Dams - either as a condition attached in pending relicensing proceedings or in other ways where no such proceeding is likely in the Early Action period.

2. "Fish for Fun" sites should be developed at appropriate locations allowing non-barbed fly casting or general fishing with very limited catch.

3. Because a large proportion of man's pursuit of fish and wildlife occurs on private land, it is particularly important that the Early Action Plan recognize the role of educational and other programs geared toward promoting mutually beneficial cooperation between sportsmen, other land uses, and landowners.

Preservation of Sites of Archeological, Historical or Natural Importance

Again, the sub-committee is pleased with the extensive consideration given to preservation of sites, both in the Investigation and in the Early Action Plan. Although the inventories of sites range well beyond ones that might be especially imperiled or safe-guarded in connection with development of the basin's "water and related land resources," the inventories will be useful for a broad number of purposes over the years ahead. For such use, it would be desirable that they be separately published for distribution to interested parties throughout the basin. (Indeed, the same suggestion might be made with regard to various other parts of the Investigation's results, as presently incorporated in the Appendices to the Main Report.) Awareness of the existence of these sites will help prevent their needless destruction or neglect, and will also help focus public concern upon those meriting public acquisition or public assistance in some manner.

# REPORT OF THE SUBCOMMITTEE ON UPSTREAM WATER AND RELATED LAND RESOURCES

Barbara M. Deitrick, Chairman
Howard J. Cadwell
Warren M. Sinclair
John P. Wilson

Our collective propensity for environmental quality leads us to a generally favorable view of the programs recommended by the United States Department of Agriculture for "Upstream Water and Related Land Resources." Land management and conservation measures are an integral part of structural as well as non-structural programs. Implementation is dependent upon local initiative and responsibility.

We were unable to determine the impact of these programs on the basin as a whole, and we lacked sufficient information to make judgments on specific proposals. The following comments concern some, but not all, of the recommendations and are intended to indicate programs and problems we believe should be emphasized:

## USDA Technical Assistance Programs

These include assistance to towns in the preparation of resource inventories, soil reports and interpretations, flood plain identification and information studies, and soil surveys. This kind of basic resource information should be the foundation for planning and zoning throughout the basin. To this end, we urge that the recommended modifications in law and increased funding be adopted to permit the extension of programs to urban areas. Acceleration of programs is also important.

## Open Land

The Main Report states: "The scenic attractiveness associated with diversified land use is being diminished through the construction activities of man and the natural process of succession. In many areas the desirable balance among water, forest, and meadows that once typified the New England landscape has been or is in the process of being lost." Other comments on this problem are scattered throughout the report. This concern might better be dealt with as one central and integrated subject.

In order to prevent abandoned farmland from reverting to less desirable use, emphasis should be placed on developing programs to maintain and preserve their "open land" and esthetic character. Land use projections predict that crop land will decrease from 9 to 2 percent and pasture land from 4 to 1 percent by 2020. While these lands represent a small percentage of total basin area, they represent a high percentage of lower slope and valley areas. Their loss as "open land" could have devastating effects on the esthetics of the basin. Other programs should be developed for the rotational cutting of forests, the introduction of wildlife cover and feed areas (particularly "edges") and for the addition of such lands to the public domain.

## Flood Plains and Wetlands

High priority should be assigned to the task of preserving and protecting these areas. All flood plains should be identified and zoned to prohibit industrial and residential development in their midst. Restoration programs should be developed for urban flood plains.

The protection and preservation of inland swamps and bogs and estuary saltmarshes deserves more attention in the Plan. State legislation in Massachusetts and Connecticut affords these resources some protection, but there is a need for acquisition money, private and public, to insure preservation.

## Research and Education

We strongly believe that implementation of the Basin Plan depends on developing widespread understanding and knowledge about our water and land resources. Many of the recommendations, especially the non-structural type, must be initiated and carried out at the local level. USDA has recommended accelerated efforts in conservation education at all educational levels by its agencies. However, we suggest that public and private agencies concerned with various aspects of conservation and resource management should also accelerate education programs.

We agree with the recommendation concerning research needs, especially in the following areas:

- Streamflow and sediment rate measurements under different land uses and topographic and soil conditions;
- Reservoir sedimentation rates and trap efficiency of the sediment pool;
- Forest and agricultural land treatment measures and their effect on hydrologic conditions;
- Evaluation of reservoirs and other public works projects;
- Effects of water impoundments on fish and wildlife habitat;
- Multiple uses of municipal watersheds and the effect of these uses on water supply and quality.

Other Potential Water Improvements

In addition to the 17 Small Watershed Projects recommended for early action, USDA identified and evaluated 345 water impoundment sites in the upstream areas. BOR, U.S. Fish and Wildlife Service and state fish and game departments aided in the evaluation. Of these, 118 are recommended for development. On page F-255 of Appendix F it is stated: "These impoundments have been included in the plan to meet the following needs: (1) flow augmentation for downstream fish habitat improvement and for water quality improvement through the dilution of effluents after secondary treatment; (2) permanent lake storage for recreational boating, water contact sports, and recreational fishing; and (3) storage for urban and rural water supplies."

Along with other members of the Citizens Review Committee, we have doubts as to the desirability and workability of multi-purpose storage areas, particularly where low-flow augmentation and recreation are combined.

Another problem presented by this recommendation is the lack of information on how and by whom these projects would be constructed. They apparently do not qualify as Small Watershed Projects under Public Law 566, but we could find no reference to other programs or to the extent of local participation and responsibility. Without answers to at least some of these questions, it is impossible to assess the value of this recommendation.

Site Acquisition

With the prospect of an ever-increasing population and the attendant pressures on land resources, sites for a variety of purposes should be acquired as rapidly as possible. But acquisition of land by governments is fraught with difficulties. State and local governments are faced with severe financial problems which raises a serious question as to how much money will be allocated for land acquisition. Local jurisdictions strongly resist the removal of land from the tax rolls. A solution to the latter problem may be found if a satisfactory system of payments in lieu of taxes can be worked out. Other problems are presented by public distrust of government ownership and fear of the eminent domain power. Some of these problems might be alleviated somewhat by guarantees that sites will be used for the stated purpose and purchased through negotiations at "fair market value."

We have previously recommended purchase of "open land" areas, wetlands and flood plains. To this list should be added sites of historic and archeological interest and other natural resource areas of unique or unusual quality. While a large number of sites are listed in Appendix O, a more comprehensive identification study is required to permit assessment of quality and to insure consideration of all possible sites.

Regulation of Dams

Small as well as large dams should be provided with devices to regulate flow.

CRB Program

While recommendations concerning Plan implementation are not part of our assignment, we wanted to express our hope that the CRB Program will soon be operational. This carefully thought-out proposal will provide an "institutional arrangement" tailored to the needs of the Connecticut River Basin.

It is not our wish to inundate the Program before it can take preventive measures. Nonetheless we'd like to suggest that the primary task of the Program be education and information. The challenge and difficulties of this task are matched only by its importance.

# REPORT OF THE SUBCOMMITTEE ON IMPLEMENTATION

Thomas J. Rouner, Chairman
Mrs. Bertrand H. Brown
Mrs. Bernard H. Flood
Senator Douglas B. Kitchel
D. Day Lee
Mrs. George P. Williamson

The Connecticut River Basin Study Report indicates that, in contrast with most previous studies of this nature, remarkable improvement has been made in the art of coordination among Federal, State, local and private interests in arriving at this guideline plan for New England's largest river. The results provide public encouragement for future such efforts in the complex field of water and related land resources.

The Connecticut River Basin Citizens Review Committee, in conducting its review and in rendering its report to the New England River Basins Commission, agrees with the statement in NERBC's "Background Information" memorandum of December 1, 1970, that:

> The report of the Connecticut River Basin Coordinating Committee is intended to serve as a flexible guide for future water and related land resource planning in the Connecticut River Valley. It provides a general appraisal of the probable nature, extent and timing of needs, and measures to meet these needs, and further provides a framework for future general and detailed planning by federal, state, local and private interests. It is not a request for project or program authorization or funding, either at the state or federal level. The report does not supersede normal administrative and legislative procedures for project and program authorization and funding, and therefore does not constitute binding authorization of any project whether recommended by the Coordinating Committee or by any other federal, state or regional body acting separately from the Coordinating Committee.

Pursuant to the Background Information memorandum of December 1, 1970, it is clear that actual implementation of the plans, programs and projects delineated in the Study Report will be dependent upon current governmental machinery under existing federal, state and local statutes and regulations. Even though current implementation processes are laborious, time consuming and expensive, nevertheless they do afford numerous checks and balances, they are reasonably well understood and are generally acceptable as part of the price to be paid for maintaining our treasured democratic processes.

The New England River Basins Commission was authorized by the Water Resources Planning Act (Public Law 89-80) in 1965 and was established by Executive Order of the President in 1967 upon the unanimous request of the Governors. It is now in center stage.

Briefly, the duties of NERBC in the field of water resources (subject to explicit limitations that preserve the Federal and State authorities and responsibilities in water resource matters) are as follows:

(1) Serve as principal agency for coordination of federal, state, interstate, local and non-governmental development plans in the area.

(2) Prepare and keep up to date a coordinated, joint plan for federal, state, interstate, local and non-governmental development of water resources, including evaluation of all reasonable alternative means of development, including recommendations for individual projects.

(3) Recommend long-range schedules of priority for basic data, investigation, planning and construction of projects.

(4) Foster and undertake studies in preparation of the coordinated plan in (2) above.

Thus NERBC is authorized and directed by law to do the job of coordination and planning in water resources that long has been sought for New England. NERBC is a soundly financed, co-equal federal - state body that is gradually but surely becoming known and accepted for its logical place in the water resource matters of New England. Although NERBC arrived on the New England scene well after the Connecticut River Coordinating Committee study was underway, it became a full fledged member thereof, actively participated in the Study Report and is the natural recipient of the goodwill, functions and works of the Coordinating Committee.

The many complexities and diverse interests in the future of the Connecticut River basin demonstrate the necessity for a continuing body working to secure a unified and coordinated program for planning and operation of the basin's water and related land resources.

The Coordinating Committee has proposed the establishment of such a continuing mechanism within NERBC, to be identified as the Connecticut River Basin Program (CRBP).

We endorse the establishment of CRB Program as part of an existing federal-state agency, namely NERBC, thereby requiring no new enabling legislation. It can be immediately implemented by NERBC and the four Connecticut valley states and moreover it will provide for allocation of the state share of costs among only the four participating states. If in the future other river basins of New England require similar concentration of effort, the local state share of their financing can be allocated in similar manner. Also the CRB Program incorporates an essential element for acceptance by the public in the establishment of a Citizens Advisory Board. Such an Advisory Board will insure citizen participation and support of plans that will reflect public needs and desires and will assist in resolving those parts of the Comprehensive Plan that are currently controversial. (A diagram of the Proposed Connecticut River Basin Program submitted to the Coordinating Committee by the Ad Hoc Committee on Institutional Arrangements is attached.)

However, should there arise any material delays in establishing and funding the proposed CRB Program then the NERB Commission itself must forthwith engage in the performance of the functions of coordinating, planning and scheduling water and related land resource matters in the Connecticut River Basin, as it is legally required to perform for New England's river basins.

In summary the CRC is vitally concerned that adequate resources be made available by federal and state governments (and other sources) in order to continue without interruption the planning studies undertaken in this six-year comprehensive Connecticut River Basin study. As part of the planning process it is especially important that priority be given to further evaluation of flood risks and protective measures, to the ecological aspects of major proposed changes in existing water and related land resource conditions in the basin, to expanded monitoring of water conditions, to the maintenance and improvement of analytical models - both physical and econometric - and to numerous other matters covered in the study report.

It is equally important that provision be made for an effective citizens advisory group and for effective public information activities. Environmental impact studies should be made readily available to the public for study and comment before any final decision is made on a given project.

The Citizens Review Committee expresses its special concern that NERBC seek really adequate financial resources for its Connecticut River Basin Program. CRC members can continue their individual good citizenship roles by registering this concern with their respective congressional delegations and state governments.

In a closely related matter the CRC is aware that the Connecticut River Basin is vulnerable to damaging land subdivisions and land uses that will have long-range deteriorating effects upon the area. Therefore it is recommended that each state take prompt legislative action to provide protection against such abuses and to assist municipalities and other local bodies in insuring such protection. For example, in 1970 Vermont took progressive action in this direction by enacting "Vermont Planning and Development Act - V.S.A. 24" * which together with other legislation not only assists municipalities in strengthening their existing zoning and subdivision regulations but also provides methods for unzoned municipalities to easily and promptly adopt a prepared 2-year interim stop-gap zoning regulation to remain in effect while full local zoning regulations are being derived and enacted.

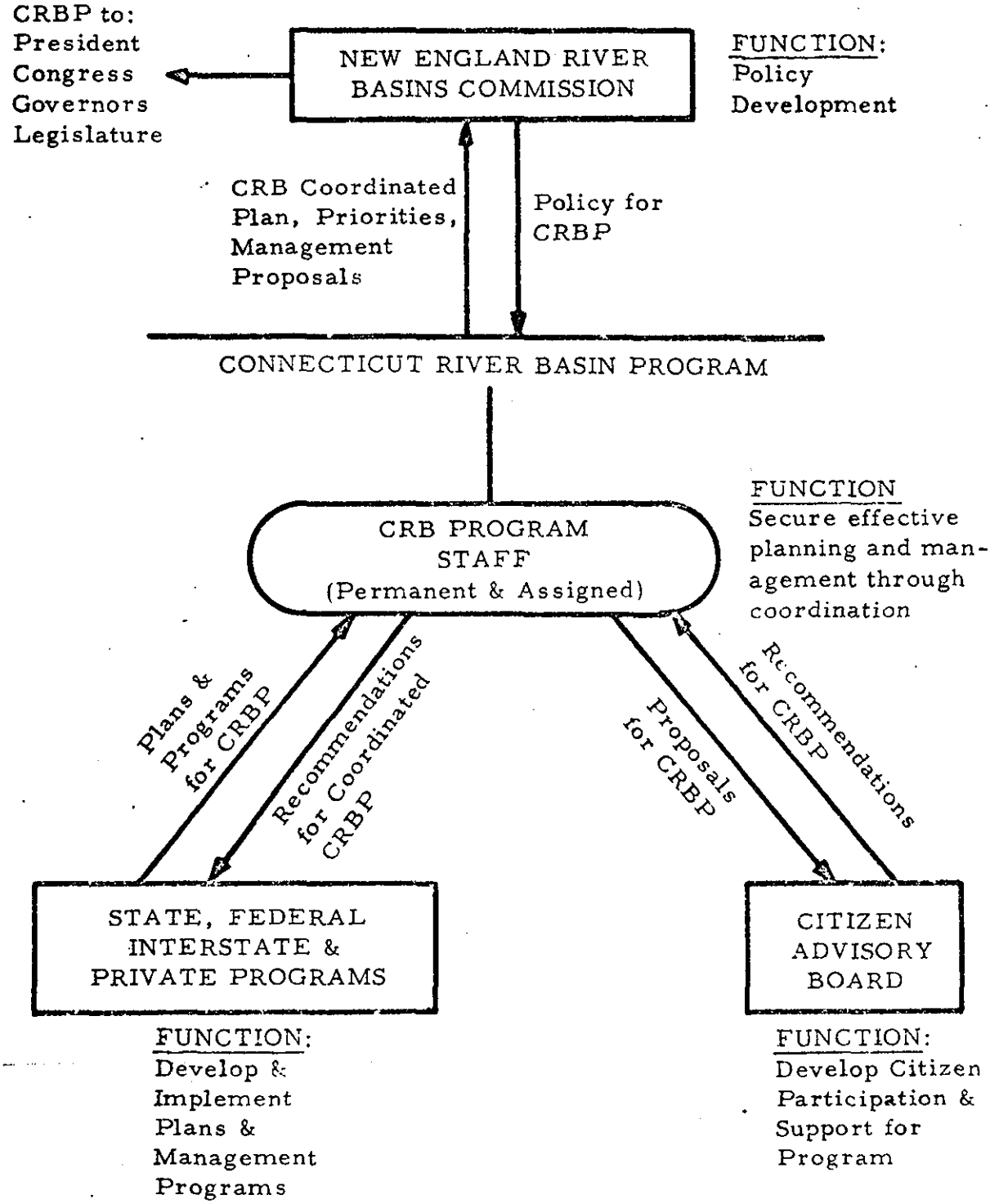
* The Vermont Municipal and Regional Planning and Development Act of 1970, V. S. A. Title 24, and the Vermont Environmental Board and District Commissions Act of 1970, V. S. A. Title 3.

A PROPOSAL FOR A

CONNECTICUT RIVER BASIN PROGRAM

OF THE

NEW ENGLAND RIVER BASINS COMMISSION



MINORITY REPORT: Items needing greater emphasis in the report of the Connecticut River Basin Citizens Review Committee
Thomas J. Rouner

1. Let's go with the New England River Basin Commission

The NERBC is now emerging into public confidence with promise of becoming the effective federal-state body long needed in this area. Any proposal for a new regional or basin-wide governmental organization, such as an interstate compact, would be particularly confusing at this time, and would be fraught with extensive delays and probable failure. NERBC needs expanded support and an extended opportunity for successful operation.

2. Ecology, Environment and Economics

After a late start Ecology and Environment have, fortunately, burst upon this technological age with widespread demands for much greater attention. This is good. We must take advantage of this current momentum to do a lot of cleaning up of both our water and air resources and environmental quality in general. Technological know-how is available for doing this. Vast sums of money will be required and therefore pressures must be maintained to produce adequate results. Although the current environmental crusade is very meritorious, steadier heads among the informed must aid in avoiding the development of an ecological hysteria based on exaggerations that could disrupt the general economy and damage the public good. We are an economic society with great dependence upon the wise use of our natural resources. All sides must work harder at developing balanced compatibility between ecology and economics, between the environmentalists and the engineers. Thus worthy projects involving water and related land resources will hereafter require more planning, more public participation, more responsivness to public needs, and therefore more time and money than heretofore. The public appears to be prepared to bear increased social costs in order to have more environmental quality in its engineering projects.

## 3. Flood Control

The Connecticut River Basin still remains very vulnerable to catastrophic floods such as occurred here in November 1927, March 1936, September 1938 and August 1955, in spite of the fact that considerable progress has since been made in reducing flood damage potentials. Although flood plain regulations and other measures should be employed to partially ameliorate the existing flood menace, the construction of additional flood control reservoirs capable of temporarily withholding major flood waters from sizable segments of the Connecticut River drainage area constitute a positive and practical means of further protecting those permanently established population centers lying alongside the river below the potential flood control dam sites.

The present wave of animosity against so-called large dams and against the agency which designs and constructs them must not be allowed to block the construction of justifiable flood control reservoirs to further protect vulnerable population centers against the inevitable devastating floods of the future. Better communications through citizen advisory groups should be helpful in breaking the present log jam. We must not await the arrival of the next great flood to jar us off the current dead center.

## 4. Low Flow Augmentation

The normal runoff pattern for the Connecticut River consists of a spring freshet followed by low flow conditions in the summer and early fall, although there are many variations in this pattern from year to year. Low flows also frequently occur in mid-winter under freeze-up conditions. Down through the decades a number of headwater reservoirs have been constructed, generally for power purposes, which store their spring freshet flows for later release, usually in the late fall and early winter when daylight hours are short and power demands tend to reach their peaks. The total volume of such seasonal storage is relatively small in its influence upon the annual runoff pattern of the main body of the Connecticut River system. The spring freshets and the summer and fall droughts still persist. Thus there is a marked need for additional seasonal storage in headwater reservoirs of considerable size operated for the primary purpose of transferring spring freshet waters into the dry periods of summer and early fall where the benefits would help to satisfy many widespread water needs including swimming, fishing, water supply, boating and canoeing, fish and wildlife, scenic values,

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# CITIZENS REVIEW COMMITTEE -- AN EVALUATION

by Professor Bernard Berger, CRC Moderator, and
Clyde O. Fisher, Jr.

The use of a group of citizens to review a technical report of far-reaching importance -- in essence to play a key role in the planning process -- has few precedents in regional water resources development. An evaluation of the experience of this CRC therefore seems to be in order. It is fair to ask: Was the Committee's performance productive? What lessons were gained from this experience and does it suggest a procedure that should be repeated?

The establishment of a Citizens Review Committee composed of individuals with demonstrated concern for the prudent development of their regional water resource was in itself no guarantee that their efforts would be productive. Actually some basis for doubt existed at the outset, even on the part of Committee members themselves. Consider the situation: a group of private citizens, few with technical background and all with competing demands on their time and energy, attempting to review reasonably in 90 days a document prepared by many specialists in many fields over a period of six years at a cost of $3.5 million. Adding to the difficulty of the assignment was the initial diffuseness and uncertainty of the Committee's objectives. The fact that a Committee could be formed is testimony to the strong public concern for the proper development of the Connecticut River and its related land resource, and the willingness on the part of public minded citizens of the Basin to accept a share of the responsibility for this program.

The utility of the Citizens Review Committee's efforts will be determined by

the effect of its comments and recommendations on the final form of the comprehensive plan, on priorities established, and on decisions for implementation of the plan.

The Committee members feel that their efforts do in fact constitute a positive contribution. This was evident in that there was nc flaggingof interest and work effort during the 90 day period. Issues were discussed in as much depth as possible and debate was stimulating and spirited. Any limitation on the value of the Committee's contribution may be attributed to absence of necessary basic information and to a certain extent on the lack of technical expertise.

Beyond the immediate contributions to the Connecticut River plan, and very important in the long term, will be the value of the current experience in providing a basis for improved citizen participation in future programs. The following observations are in this sense particularly pertinent.

> A Citizens Review Committee with only a 90-day existence can fill only a limited role. It can spotlight certain issues, question various assumptions and conclusions, and suggest new or different emphases to those who will be continuing the planning process and making implementation decisions. This much is important, and this much we trust our own Committee has done. But even this role can be played only in proportion to the background and involvement the Committee members already have in the subject matter under review. Thus, a short-term ad how review group is unlikely to represent the interests of all segments of the Basin community as well as could a longer-term group. Moreover, a short-term group has little opportunity to seek broader public reactions, or communicate effectively with a broader public during the course of its work. Thus, it is pleasant to learn that in an investigation elsewhere a Citizens Review Committee is being established earlier in the study, perhaps as a result

of our experience, and that some members of the Connecticut River Basin Coordinating Committee believe that had our Citizens Review Committee been so established, it might have brought to life the public hearings and the information efforts that achieved only limited results in the course of preparing the Connecticut River Basin Plan.

We would suggest, further, that in future programs the Citizens Review Committee be launched with a thorough briefing on the history of plan development and related studies. The briefing should clarify the nature of constraints imposed on the planners, the major issues confronted (or not confronted) to date, and the decisions already made (or not made). In general, the briefing should go more into matters not covered in the written material available to the Citizens Review Committee. In the current case, for example, vital information and insight might have been gained by a briefing on the essential matter of alternative plans and plan elements considered in formulation of the Early Action Plan -- a matter on which the 9-volume report is almost totally silent. Subsequent briefings would similarly be in order, especially if the published material is as difficult to read and find one's way through as in this present case. Further, had the Citizens Review Committee been established earlier, it could have benefited by attending formal public hearings held by the Coordinating Committee and by holding its own public meetings.

Our experience also suggests the following: (1) the role of a Citizens Review Committee is to spotlight issues, provide new emphases, and constitute a linkage to the broader public. The Committee should not be expected to undertake technical analyses or to evaluate the technical accuracy of staff reports. Perhaps the single most important function of the Committee is to evaluate alternative measures for achieving desired goals. In this connection, a major need is the development of procedures and criteria for conducting such evaluations. (2) The citizens review committee should be large enough to provide reasonable representation of geographic areas and of the major groups concerned with the Basin's resources. In this connection, the two members per State suggested for a Citizens Advisory Board in the Connecticut River report appears to be inadequate .

The foregoing comments suggest some of the difficulties experienced by the Citizens Review Committee. Barriers in understanding highly technical concepts were troublesome, especially those used in justifying flood control structures. A joint meeting

of the Citizens Review Committee with the Connecticut River Basin Coordinating Committee helped to clarify the nature of such problems, but not to eliminate them. Other difficulties perhaps more obscure included a general feeling of inadequacy, and even a sense of futility, at the outset of the assignment, induced by the massiveness of the report to be reviewed and its technical aspects. This difficulty appeared to be reduced as the Committee came to grips with its tasks. Also there seemed to be an inability to sense the plan as an integrated whole, a failure to see how its parts fitted together. The Committee seemed to feel that a considerable body of information of vital concern in plan evaluation was not incorporated in the 9 volumes of the report, although such information was essential to plan development. The stress of time was acute; however, this may well have been an advantage as it resulted in an effort that was sustained at a surprisingly high level of intensity. Last but not least, was the apparent opposition of a group of articulate ecologists and conservationists who quite clearly were convinced that the comprehensive plan if implemented would produce an ecologic disaster in the Basin. By openly expressing their fears concerning the objectivity of the Citizens Review Committee, they tended to keep the Committee members alert to the special problems of environmental quality; their influence was quite likely beneficial.

It was of course not to be expected that the final recommendations of the Citizens Review Committee would reflect unanimity of view on all elements of the comprehensive plan and the diverse issues encountered. The inclusion of minority reports is evidence that such unanimity did not exist. In fact, it is surprising that more minority reports were not prepared. This may have represented more an inability on the part of the

Committee members to come to grips with certain significant issues and plan proposals than actual agreement on courses of action proposed in the plan. It is probable that the ecologic studies called for will clarify and sharpen many important issues and provide a more substantial base for evaluation, debate and action.

The task of the Citizens Review Committee was not an easy one, but the Committee members responded vigorously and with dedication to the challenge given to them. The experience proved once again that interested citizens will work hard to make a vital and constructive contribution to the planning of programs concerned with development of their regional resources. It demonstrated further that such contribution should be part of the overall planning process. The willingness of concerned citizens to share in this effort has been expressed by one of the Committee members: "The Citizens Review Committee is grateful to the New England River Basins Commission for this opportunity to participate in the review of the Comprehensive Plan. We especially thank those who suggested that such a Committee be established, and those who then labored with and encouraged us in our work". The lessons learned will make future efforts increasingly effective. There is justification, therefore, for adopting continuing programs of citizen participation in comprehensive planning of river basin development.

CRC members' comments on "Citizens Review Committee--an Evaluation"

The prime purpose of CRC was to provide an expression of citizens views to NERBC et al as an aid in drafting of their reports, and perhaps to persuade decisionmakers at federal and state levels regarding the original plan or possible negotiation of alternative proposals and priorities. It would then appear that, in this particular case, members of CRC are what their name implies, reviewers not planners; also that any impact from their humble deliberations and recommendations would hopefully affect implementation. - Warren Sinclair

When and if another CRC is formed under conditions such as ours was authorized, I suggest that the federal and state government agencies involved request employers of CRC members to assign them to detached duty from their normal workload. - Joseph Niquette

The challenge is to make CRC a force for getting action - particularly at the legislative and governmental agency levels. Perhaps this thinking recasts the CRC as a Citizens Action Committee. - Howard Cadwell

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## CONNECTICUT RIVER BASIN COMPREHENSIVE
## WATER AND RELATED LAND RESOURCE INVESTIGATIONS

NOVEMBER, 1, 1970

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# MINUTES

**First Meeting of the Connecticut**

**River Basin Citizens Review Committee**

**Amherst, Massachusetts**

October 23, 1970

**David C. Harrison**
**Senior Staff Associate**
**New England River Basins Commission**

## SUMMARY

The Citizens Review Committee:

* Agreed to open all regularly scheduled Committee meetings to the public;
* Requested the Chairman of the New England River Basins Commission to appoint five additional members to the Committee;
* Clarified its basic mission;
* Established a deadline of January 15, 1971, for completion of its work;
* Agreed to organize its review procedure at its next meeting;
* Identified tasks to be performed by Committee members preparatory to the next meeting;
* Agreed to hold its next meeting at the same place, November 12, at 11 a.m.

## ATTENDANCE

The first meeting of the Citizens Review Committee convened at 1 p.m., October 23, 1970, in conference room 905, Lincoln Campus Center, University of Massachusetts, Amherst, Massachusetts. Members of the Committee attending were:

Professor Bernard B. Berger - Moderator

Connecticut

Betty Brown - Glastonbury
Barbara H. Deitrick - Old Lyme
Peter M. Stern - Glastonbury

Massachusetts

Howard J. Cadwell - Greenfield
Florence M. Carver - Amherst
Mrs. Bernard H. Flood - Lenox
Victor N. Gagnon - Springfield
George R. Higgins - Amherst
Day Lee - Deerfield
Warren M. Sinclair - Gardner

New Hampshire

Harlan Logan - Meriden
Allie Quinn - Hanover
Thomas J. Rouner - Westmoreland
John P. Wilson - Lancaster

Vermont

Richard M. Brett - Woodstock
Emery C. Evans - Guilford
Ralph Lehman - White River Junction
Georgie Williamson - Woodstock

The Coordinating Committee for the Connecticut River Comprehensive Water and Related Land Resources Investigation was represented by Laurence Bergen, New England Division, U.S. Army Corps of Engineers. The NERBC was represented by R. Frank Gregg, Chairman, and by David C. Harrison, Senior Staff Associate and Administrative Staff Assistant to the Citizens Review Committee. University students and faculty attended as observers.

## OPEN MEETINGS

The Committee agreed to open its first meeting to representatives of the press who were present and to university student and faculty observers. It was further agreed that all regularly scheduled meetings of the committee would be open to the public.

## COMMITTEE MEMBERSHIP

The Committee requested that Mr. Gregg appoint five additional members to the Committee after consultation with Basin-state NERBC members, with due regard for geographical, specifically urban, orientation and views with a deadline of November 1 beyond which no more appointments would be made.

### Nominees

The Committee's action was in response to the Moderator's letter of invitation to attend the first meeting, which requested that members consider the need for additional representation of Basin interests on the Committee and be prepared to suggest specific nominees. Names submitted for Mr. Gregg's consideration were:

by Mr. Stern (Connecticut):
Clyde O. Fisher, Jr., of Hartford

by Mr. Gagnon (Massachusetts):
Joseph L. Niquette, of Holyoke
Henry DeMers, of Springfield
The Mayor of Springfield or his designee
The Mayor of Chicopee or his designee

by Mrs. Williamson (Vermont):
Judge John H. Carnahan, of Brattleboro

Mr. Gagnon additionally recommended representation of blacks on the Committee.

Criteria

The following criteria were suggested for Mr. Gregg's consideration in making appointments:

* balanced representation of differing points of view on a wide spectrum of issues dealt with in the Report - Professor Berger and Mrs. Carver;
* additional representation of the Springfield-Chicopee-Holyoke metropolitan area, in response to concerns expressed by the mayors of these cities and in keeping with the principle that representation should follow population - Mr. Gagnon;
* representation primarily according to subject matter, in order to avoid the necessity of representing specific geographic locales and population elements, many of which are incidentally represented, for example, by the League of Women Voters Interleague Committee for the Connecticut River - Mrs. Flood;
* representation of flood-impacted people as well as conservationists - Mr. Cadwell;
* predominantly lay representation - Mrs. Deitrick

Mr. Gregg introduced the discussion of Committee membership by suggesting that the Committee may require additional representation of the poor and inner city ethnic minorities and of the far northern portion of the Basin. Where Committee membership might be in danger of expanding beyond manageable limits, as Mr. Lee cautioned, Mr. Gregg urged Committee members to fill remaining gaps in representation by identifying secondary sources of opinion and information among

individuals and organizations in each state known to be qualified to supply such information. He noted that this had already been done by Mr. Brett in Vermont.

### Procedure

In response to a motion that he be requested to appoint the Committee's nominees, Mr. Gregg explained that he lacked the authority to appoint nominees without the concurrence of the Basin-state NERBC members. A motion was also considered and turned down that Committee membership be limited to 30.

## COMMITTEE MISSION

The Moderator suggested that the Committee's mission be:

* to examine the validity of assumptions and planning criteria and principles used by agencies participating in the study;
* to reach general agreement on which projects are desirable;
* to identify projects to which opposition has been expressed and develop a Committee stance on their desirability.

### Assumptions

Reference was made to the need to question assumptions and planning criteria in order to assess the Report's overall logic and to establish reference points for evaluations of specific proposals. Mr. Brett questioned whether it would be possible for the Committee to extend its review beyond philosophical considerations in the time allowed, in view of the size of the Report.

Assumptions specifically requiring examination relate to:

* projected Basin population growth - Mr. Brett:
* specific means for implementing environmental quality as opposed to other programs - Mr. Lee;
* economic development requirements in northern, especially New Hampshire, parts of the Basin - Mr. Logan

### Specific projects

Mr. Gregg explained that while the Coordinating Committee Report is a guideline against which specific recommendations can

be made, it is also quite specific in some of its recommendations, and the Committee may therefore not only test the Report philosophically but may also comment on the desirability of specific proposals. Mrs. Brown and Mr. Stern recommended that the Committee focus its review on the short-term 1980 Action Plan. Mr. Rouner and Mr. Gregg noted, however, that even though the 1980 Action Plan recommends specific projects, it does not constitute a request for legislative authorizations and appropriations for specific agency projects and programs. These must be obtained through regular project authorization and budgetary procedures for each agency in Washington and in each of the Basin states. Professor Berger observed that agency priorities are nonetheless reflected in the Report. Mr. Rouner recommended that since the Report is not an agency request for project/program funds, the Committee ought to address itself to project priorities rather than to the desirability of individual projects.

In commenting on the desirability of recommended projects, Mr. Lee stressed the importance of considering all points of view so that the Committee could exercise a collective wisdom. Mr. Gregg suggested that the Committee's mission in part is to conduct its review of specific projects in such a way that areas of agreement and disagreement could be quickly isolated.

## DISTRIBUTION OF COORDINATING COMMITTEE REPORT

Each Committee member has received a copy of the Coordinating Committee's Main Report (Volume one of nine volumes) and background materials from the NERBC explaining the genesis of the Committee and the review procedure; identifying all participants in the review; and commenting generally on the mission of the Committee and its tasks. Travel expense reimbursement forms were distributed at the meeting.

Mr. Bergen explained that the Report was being distributed in part as follows:

* 10 complete nine-volume sets to each member of the Coordinating Committee, including the Basin state members;
* two complete sets to the Moderator of the Citizens Review Committee;
* one complete set to each of 38 university libraries at the end of the 90-day initial review period (roughly October 15 -January 15).

Mr. Gagnon stated that Committee members would have difficulty reviewing the Main Report without easy access to the appendixes and, further, that access to the appendixes furnished by the NERBC to Professor Berger* at Amherst was not easy.

Mr. Gregg suggested that complete sets might be made available to Committee members through the Basin-state members of the Coordinating Committee. It was noted that the availability of the appendixes would be relevant to the organization of the Committee's work, and it was suggested that specific appendixes might be borrowed from Professor Berger.

SCHEDULE

The Committee agreed to a deadline of January 15, 1971, for transmittal of its report to the NERBC. Mr. Stern questioned whether the review period was too short. Mr. Gregg explained that the NERBC's review would begin after receipt of the Committee's and other review bodies' comments.

MODUS OPERANDI

The Committee deferred the decision how to organize its review--i.e. identifying tasks, assigning responsibilities, and establishing a schedule and procedural guidelines. Mr. Gregg suggested that the Committee be prepared to settle these issues at its next meeting.

*Subsequently it was learned that Committee members could have full sets of The Report on request to David Harrison.

## ASSIGNMENTS FOR NEXT MEETING

Professor Berger asked each member to give careful consideration to two major topics prior to the next meeting:

1 -- organization of committee for completing its work;

2 -- initial evaluation of report assumptions and recommendations.

### I. INITIAL EVALUATION OF REPORT

Professor Berger asked each member prior to the next meeting to:

* develop a statement on general assumptions in the report, not as they have been used to screen specific projects but as they stand on their own. The kinds of assumptions referred to relate, for example, to projected population growth and economic development requirements;

* develop a statement expressing judgments on project/program priorities;

* identify projects/programs that are:

  good;

  questionable; or

  "I don't know", i.e., about which there is not an adequate basis upon which to express judgment.

The Committee would focus on the "questionable" category.

Professor Berger requested that the statements be forearded to him by November 4 in time for Mr. Gregg to have them reproduced and distributed to the Committee no later than November 5.

The assignment regarding the desirability of projects was described as consisting of two parts:

first, each Committee member was asked to assess a project's desirability within the context of his background and of the views of others whom he might consult. Projects would be viewed individually, and objections could be stated; subsequently, Committee members would be asked to consider the ability of such projects to advance general Basin-wide interests. Recommendations applicable to sets of projects could be made, viewing these as elements of a Basin-wide resource management system.

It is foreseen that objections to a specific structural or non-structural proposal might be found, while a set of proposals could be recommended that includes the otherwise objectionable proposal as an essential part.

General assumptions

Mr. Stern stated that the main question to be addressed regarding assumptions ought to be the relative weight given in the report to the three "accounts": national efficiency; environmental quality; and regional development, as they apply to "hot potato" projects.

Project priorities

Mr. Pouner suggested that the Committee define project priorities in terms of major functional needs, e.g. recreation, flood control, water quality, etc., and the public finances needed and available to meet them, rather than in terms of degrees of local public sentiment. Mrs. Quinn noted that attaining environmental quality objectives on the whole costs less than other objectives and that "hot potato" projects should not be equated with the most expensive projects.

Project desirability

The question was raised whether Committee members could identify problem projects out of their own experience without reading appendixes to the Main Report. Mr. Sinclair suggested that the Committee consider holding hearings to elicit local opinion on specific projects; Mr. Bergen noted that Appendix O to the Main Report abstracts the public hearings held by the Coordinating Committee. Mrs. Carver recommended status reports on Basin-state legislation affecting specific project sites.

## II. ORGANIZATION OF COMMITTEE WORK

Members were requested to come to the next meeting with specific suggestions on how to organize for the performance of its work, including:

- breaking the review down into manageable tasks --perhaps by function (water resources, water supply, etc.) or in other ways;
- assigning responsibilities to members or groups of members to study and make recommendations to perform tasks on behalf of the full Committee;
- establishing a schedule for performance of work;
- resolving procedural issues, including such items as Committee sponsorship of public meetings, etc.

Mr. Gregg suggested that it would be essential to complete the organization of the Committee work at the next meeting if the review schedules are to be met. Mr. Berger concurred, and repeated his request for Committee attention to this point.

## Time and Place of Next Meeting

The Committee agreed to hold its next meeting at the same place, * November 12, at 11:00 am. The Committee adjourned at 3:40 pm.

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* Subsequently changed to the Hampshire-Essex rooms, student union, immediately adjacent to Lincoln Campus Center, University of Massachusetts, Amherst.

# MINUTES

**Second Meeting of the Connecticut River Basin Citizens Review Committee**

**Amherst, Massachusetts**

November 12, 1970

David C. Harrison
Senior Staff Associate
New England River Basins Commission

SUMMARY

The Citizens Review Committee organized into six subcommittees, preliminarily assigned responsibilities and established a schedule for the performance of its work.

Subcommittees

Subcommittee on Assumptions, Planning Principles and Criteria

Gossland, Chairman
Brett
Flood
Gagnon
Higgins
Lee
Rouner
Stern

Subcommittee on Power

Higgins, Chairman
R. Brown
Cadwell
Carver
Evans
Flood

Subcommittee on Water Supply, Water Quality, Navigation and Flood Control

Quinn, Chairman
Brett
Cadwell
Flood
Williamson
Lee

Subcommittee on Recreation, Anadromous Fish, Resident Fish and Wildlife and Site Preservation

Carver, Chairman
Fisher
Karalekas
Niquette
Sinclair
Wilson

Subcommittee on Upstream Water and Related Land Resource Potential

Deitrick, Chairman
Cadwell
Kitchel
Sinclair
Wilson

Subcommittee on Priorities and Implementation

Rouner, Chairman
Betty Brown
Flood
Kitchel
Lee
Williamson

Schedule

November 30-- submission of draft report of Subcommittee on Assumptions, Planning Principles and Criteria to Moderator who will distribute it to members

December 10-- submission of draft subcommittee reports to Moderator for distribution to the full committee

December 15--meeting of full committee to consider draft subcommittee reports

December 31-- submission of final subcommittee reports to Moderator for distribution to full committee

January 14-- meeting of the full committee to consider final subcommittee reports and to develop committee report

February 1-- transmittal of final committee report to NERBC

The Committee left open the possibility of presentations by non-member experts on specific issues of critical importance after the business portion of its next meeting December 15, pending the results of a canvass of committee members by the Moderator. Decisions on mode of subcommittee operations-- including the use of experts and timing and type of meetings was left to the subcommittees.

ATTENDANCE

The second meeting of the Citizens Review Committee convened at 10:30 a.m., November 12, 1970, in the Hampshire-Essex Rooms, Student Union, University of Massachusetts, Amherst, Massachusetts. Members of the Committee attending were:

Professor Bernard B. Berger, Moderator

Connecticut

Betty Brown - Glastonbury
Robert D. Brown - West Hartford
Barbara Deitrick - Old Lyme
Clyde O. Fisher, Jr. - Hartford
Ellsworth Grant - West Hartford

Massachusetts

Howard J. Cadwell - Greenfield
Florence M. Carver - Amherst
Joan Flood - Lenox
Victor N. Gagnon - Springfield
D. M. Gossland - West Springfield
George R. Higgins - Amherst
Peter C. Karalekas - East Longmeadow
Day Lee - Deerfield
Joseph L. Niquette - Holyoke
Warren M. Sinclair - Gardner

New Hampshire

Allie Quinn - Hanover
Kenneth Reynolds - Peterborough
Thomas J. Rouner - Westmoreland
John P. Wilson - Lancaster

Vermont

Richard M. Brett - Woodstock
Emery C. Evans - Brattleboro
Sen. Douglas B. Kitchel - Passumpsic
Ralph Lehman - White River Junction
Georgie Williamson - Woodstock

Absent were Peter M. Stern, of Glastonbury, Connecticut; Rep. Harlan Logan of Meriden, New Hampshire; and Judge John H. Carnahan, of Brattleboro, Vermont.

The Coordinating Committee for the Connecticut River Comprehensive Water and Related Land Resources Investigation was represented by Lawrence Bergen, New England Division, U. S. Army Corps of Engineers. The New England River Basins Commission was represented by Malcolm Graf, Staff Director, and by David Harrison, Senior Staff Associate and Administrative Staff Assistant to the Citizens Review Committee. The meeting was open to the public.

## INTRODUCTION OF NEW MEMBERS

At the Committee's request expressed at its meeting October 23, the Chairman of the NERBC had made five additional appointments to the Committee "with due regard for geographical, specifically urban, orientation and views." New members introduced at the meeting included Clyde Fisher, of Connecticut, and D. M. Gossland, Peter C. Karalekas and Joseph Niquette, of Massachusetts. Judge John Carnahan, of Vermont, was absent.

## REVIEW OF MINUTES OF MEETING OF OCTOBER 23, 1970

The Committee approved the minutes of the October 23 Committee meeting as printed. Mrs. Carver urged that preparation and distribution of the minutes of Committee meetings be given highest priority.

## ADDITION OF ITEMS TO AGENDA

### Committee membership

Mr. Niquette proposed that the Committee's membership be expanded to include an ecologist. Reference was made to the Committee's decision at its previous meeting to set a deadline of November 1 beyond which no more appointments to the Committee would be made. It was mentioned that "ecologist" is a general term that could apply to at least one member of the Committee (Mr. Brett). Mr. Niquette accepted the Moderator's suggestion that this proposal be considered in the discussion of use of experts under item 5(E)(2) of the agenda, modus operandi for subcommittees.

## REVIEW OF CHARGE OF THE COMMITTEE

No changes were made to the charge of the Committee, as stated on page four of the minutes of the previous meeting.

## ORGANIZATION OF WORK

### Formation of subcommittees

The Committee agreed to organize for the performance of its work by dividing into subcommittees, to each of which specific

responsibilities would be assigned. Subcommittee reports would be submitted for study to the full Committee.

Basis of subcommittee organization

The Committee chose subject matter and problem areas rather than political or geographical classifications as the basis for subcommittee organization. A discussion on the basis for subcommittee organization is attached.

The following six subcommittees were formed:

Subcommittee on Assumptions, Planning Principles and Planning Criteria;
Subcommittee on Power (corresponding with study element 2 in the Coordinating Committee Report);
Subcommittee on Water Quality, Water Supply, Navigation (commercial) and Flood Control (corresponding with study elements 1, 7, 8 and 10);
Subcommittee on Recreation (including recreational navigation), Anadramous fish, Resident fish and Wildlife, and Site Preservation (corresponding with study elements 3-6);
Subcommittee on Upstream Water and Related Land Resource Potential (corresponding with study element 9); and
Subcommittee on Priorities and Implementation.

A summary of the discussion relating to selection of subcommittee subjects is appended.

MEMBERSHIP OF SUBCOMMITTEES

The Moderator called for volunteers to serve on each subcommittee. He explained that he would make additional subcommittee assignments after the meeting in order to insure representation of a balance of geographical, technical and other orientations, as appropriate. It was understood that each member of the Subcommittees on Assumptions and Implementation would serve on at least one other subcommittee, and that all Committee members would therefore serve on at least two subcommittees.

For listing of subcommittee membership, subject to additional assignments by the Moderator, see pages 2 and 3.

Specific charge of subcommittees

Subcommittees met separately during lunch to prepare preliminary statements of their specific charges. The results were as follows:

* Subcommitte on Assumptions, etc. (Mr. Gossland)-- to identify assumptions, planning principles and criteria, and normative statements occurring in the Coordinating Committee Report, and to respond as appropriate.

* Subcommittee on Power (Mr. Higgins)-- to address these among other questions:

  - Is power synonymous with pollution;
  - Are estimates of projected Connecticut River Basin power needs in the Report realistic;
  - Should power be imported into the Basin;
  - Should existing older power plants in the Basin be updated as an alternative to the construction of new plants;
  - Is nuclear as opposed to other sources of power safe and preferable in terms of environmental impact?

* Subcommittee on Water Supply, Water Quality, Navigation and Flood Control (Mrs. Quinn)-- to follow the charge of the full Committee-- to examine assumptions, identify disputes and develop a committee stance-- pending further research and discussion. It was agreed that the scope of subject would include commercial navigation and pollution from recreational boating.

* Subcommittee on Recreation, Anadramous Fish, Resident Fish and Wildlife, Site Preservation (Mrs. Carver)-- The Subcommittee deferred definition of its mission except to include the relicensing of dams in its scope of subject. The Subcommittee felt that the operation of dams generally ought to allow for upstream fish migration and that this is covered in the relicensing of dams. Mr. Brett suggested that site preservation proposals be considered by the Subcommittee ought to include geologically and ecologically as well as historically unique sites.

* Subcommittee on Upstream Water and Related Land Resource Potential (Mrs. Deitrick)-- The Subcommittee deferred definition of its mission except to include land management on the main stem of the Connecticut River as well as upstream in its scope of subject.

* Subcommittee on Priorities and Implementation (Mr. Rouner)-- The Subcommittee agreed that organizational machinery for project/program implementation already exists through the NERBC and other governmental organizations, and additional organizations are unnecessary. The Subcommittee deferred definition of its charge and other subcommittee activities with respect to priorities until later in the 90-day review period because it was felt that the discussion of priorities ought to be initially a function of the full Committee. Flood plain zoning

was referred to as "undoubtedly an early requirement for orderly flood control in the Valley."

The Moderator asked the subcommittees to sharpen their charges and to inform him as soon as possible especially if substantial changes were made.

Modus Operandi for subcommittees

The Committee adopted the following schedule for the performance of its work:

November 30 (Monday): distribution of interim draft report of the Subcommittee on Assumptions to the full Committee, subject to revision.

December 10 (Thursday): submission of interim draft reports of the study element subcommittees to the Moderator for distribution to the full Committee.

December 15 (Tuesday): 10:30 a.m., Hampshire-Essex Rooms, Student Union, University of Massachusetts, Amherst, Mass.: meeting of the full Committee principally to consider and draft subcommittee reports.

December 31 (Thursday): submission of final subcommittee reports to the Moderator for distribution to the full Committee.

January 14 (Thursday): same place as December 15 meeting): Meeting of the full Committee to consider final subcommittee reports, to develop Committee positions based on these reports, and to plan preparation of the final Committee report.

February 1 (Monday): transmittal of final Committee report to the NERBC.

Timing of meetings

The Moderator recommended that the timing of subcommittee meetings be left to each subcommittee. However, he asked that subcommittees notify him of dates, times and places of scheduled meetings sufficiently in advance to permit notification of other Committee members who might wish to attend.

Use of experts

The Committee did not pass a motion by Mr. Gagnon that the Committee allow one non-member expert to speak on the possible impact on the environment of some or all of the projects suggested in the Main Report, after the business meeting scheduled for December 15. Mr. Gagnon had recommended that Prof. Lincoln Brower, of Amherst College, or Dr. John Brainard, of Springfield College, be invited to make the presentation.

The following points were offered in opposition to the motion:

- the use of experts should be determined by each of the subcommittees according to their specific information needs and their own judgment as to who qualifies as an "expert"--Mrs. Carver/Mrs. Flood/Mr. Cadwell;

- in order to save time, Committee members could be notified when Professor Brower's or Dr. Brainard's public lectures are scheduled and could attend individually at their convenience--Mrs. Carver;

- in order to save time, experts should be invited to submit written statements or copies of their speeches rather than make individual presentations to the Committee--Mrs. Williamson;

- invitations to experts with specific points of view to address the full Committee, prior to substantial performance of subcommittee work, would make it difficult to exercise discretion in the acceptance or denial of similar requests from other experts, i.e. "Let's balance the bias"--Mr. Karalekas/Mr. Cadwell.

Arguments in support of the motion included in the following:

- despite its overwhelming importance, the ecological impact of project/program proposals has not been adequately assessed in the Coordinating Committee Report, and a special presentation of ecological considerations by a qualified ecologist to the full Committee, although exceptional, would be justified -- Mr. Gagnon/Mr. Sinclair;

- the Committee's receptivity to at least giving local experts a chance to be heard at full Committee meetings or by any other means is a peculiarly sensitive issue--Mr. Gossland;

- the Committee as a whole would find it more of an inconvenience to attend a lecture on the ecological consequences of study proposals scheduled by an expert than to invite a presentation at a time and place of its own choosing--Mr. Gagnon;

- the exclusion of presentations by other experts before the full Committee can be justified on the ground that the Committee obviously cannot hear all experts--Mr. Gagnon.

The Moderator stated that subcommittee should use non-member experts as needed. However only if issues of exceptional urgency came up, would the Committee members be canvassed to determine whether presentations by non-member experts should be added to the agenda of the non-business portion of the next (December 15) Committee meeting. He suggested that criticality of time would make such presentations to the full Committee difficult, but they should not be precluded.

Public meetings and informal hearings

The Moderator recommended that the Committee not interfere with the subcommittees' prerogative to develop their own modus operandi. (See discussion of same topic under FULL COMMITTEE REVIEW OF SUBCOMMITTEE REPORTS, below.)

Substance of subcommittee reports

The Moderator asked the Committee members to extract from the compilation of members' comments, received pursuant to the assignment of the October 23 meeting, those items that pertain to the work of each subcommittee and to use these as inputs to the subcommittees' work as appropriate.

Target date for subcommittee reports to full Committee
(Covered under Modus Operandi for subcommittees, above.)

FULL COMMITTEE REVIEW OF SUBCOMMITTEE REPORTS

It was noted that decisions on how subcommittee reports would be used would be made by the full Committee at the meeting scheduled for January 14, when all such reports would have been submitted, distributed and reviewed.

Mechanics of review

 The Committee agreed that discussion of this item was unnecessary.

Public Meetings and informal hearings

The Committee did not feel it necessary to adopt policy governing the holding of public meeting or informal hearings by the full Committee, by subcommittees or by individuals. The possibility was mentioned by Mr. Gossland of dovetailing subcommittee hearings with meetings or hearing os other organizations such as the Lower Pioneer Valley Regional Planning Commission. The Moderator suggested that the full Committee might wish to arrange a public meeting on its own where this appeared necessary. He therefore urged the subcommittees to be prepared to present recommendations to the full Committee on disputed issues at the Committee meeting on December 15. Mr. Brett doubted that full Committee representation would be possible at any hearing held between the next scheduled meetings December 15 and January 14. The Moderator concurred that a full Committee hearing seemed overly optimistic in view of the already confining Committee work schedule. Mrs. Flood argued in favor of at least having the option to hold a hearing before January 14. Pending that decision, she pointed out that since the minutes of the Comprehensive Plan of Coordinating Committee public meetings made the issues clear, these minutes ought to be made available to the Moderator and subcommittee chairmen. Mr. Bergen 's offer to distribute compilations of these minutes was accepted; in addition, he noted that Appendix Q of the Report contains abstracts the transcript of the initial public hearings held by the Coordinating Committee in 1964 and the final hearing held by the Coordinating Committee in 1970.

COMMITTEE USE OF SOURCE PEOPLE

The Moderator assumed that source people would be utilized by subcommittees without compensation, except for essential expenses.

PREPARATION AND PUBLICATION OF FINAL REPORT

The Moderator referred this item to the December 15 agenda.

The Committee adjourned at approximately 3:45 p. m.

Note: Availability of Coordinating Committee Report to the Citizens Review Committee: Because the Coordinating Committee had not had time to budget for distribution of full nine-volume sets of the Report to the Committee, the NERBC agreed November 13 to purchase complete sets out of its own budget for distribution to the Committee. Distribution was to commence November 16. The Coordinating Committee in addition agreed to furnish complete sets immediately to public and university libraries, planning commissions and other appropriate repositories throughout the Basin, with notification to Basin media identifying the location of each repository. Non-participants in the 90-day review process who request copies of the Main Report or the complete set will be given the option of borrowing Reports so distributed

or of purchasing it. The Coordinating Committee also reaffirmed that 10 complete sets have been sent to each Basin state member of the Coordinating Committee, and that these might constitute supplementary sources of supply for the Citizens Review Committee and for those cooperating with it.

APPENDIX

to Minutes of CRC 11/12 meeting

## DISCUSSION OF BASIS FOR SUBCOMMITTEE ORGANIZATION

Mr. Lee argued that subcommittee organization ought to be "vertical," i. e. according to the impacts of different study elements upon subbasins or other common points of interaction, rather than "horizontal," i. e. according to subject matter. He stated that contradictions could be found between findings and recommendations in different parts of the Coordinating Committee Report which were attributable to the "horizontal" organization of the Report by subject matter or study element. He recommended a basis of subcommittee organization that would permit the Committee to trace how all types of study recommendations work together, for example, those relating to structural and non-structural flood control methods, such as dams and flood plain zoning, in different parts of the Basin. Mr. Brown agreed with Mr. Lee, but suggested that "vertical" interrelationships could be established and contradictions dealt with within the framework of "horizontal" subject groupings, e. g. combining consideration of flood control and low flow augmentation recommendations. Mrs. Flood stated that the number and complexity of these interrelationships precluded their serving as the basis of subcommittee organization; she contended instead that the charge of each subcommittee should include taking interrelationships between its own and various other subjects of the report into account, to determine whether contradictions exist and whether the report as a whole provides a basis for their resolution.

Subcommittee organization by states was opposed on the grounds that:

* It would tend to defeat the Committee's objective of providing an overall Basinwide review, taking into account the interrelated needs of all four Basin states and separate subbasins;

* Although the Report itself is not organized by political or geographical subdivisions, means for dealing comprehensively with related issues have been provided through the organization of the Coordinating Committee and the NERBC, and the Citizens Review Committee should not repeat the state versus state, federal versus state conflicts;

* Committee membership from each state should and probably will meet together anyway;

* Interstate/interbasin issues can be dealt with adequately by mixed state representation on subject matter subcommittees;

* Subcommittee organization by subject matter would permit committee members to perform work according to their interests and capabilities;

* The Report itself is organized by subject matter rather than by politcal or geographical subdivisions.

The Moderator suggested that the views expressed by Mr. Lee could be accommodated in the way subcommittees examined their subjects and related geographic factors, and by interactions of subcommittees.

SUMMARY OF DISCUSSION RELATING TO SELECTION OF SUBCOMMITTEE SUBJECTS, ASSUMPTIONS, etc.

It was agreed that a subcommittee was needed immediately to bring depth to the review by each subcommittee and by the full Committee of the assumptions, planning principles and planning criteria that provide the basis for the identification of needs and the recommendation of courses of action in the Coordinating Committee Report. The Moderator suggested an early target date for this Subcommittee so that its conclusions could be used as guidelines by the other subcommittees.

Study element (water supply, flood control, etc.)

The Committee opposed the formation of subcommittees corresponding with each of the 10 study elements in the Report, on the ground that these in addition to the other two subcommittees on assumptions and implementation would be too many. It was therefore agreed that some basis for combining subcommittees on study elements was needed. Mr. Gossland objected to subcommittee organization that corresponds only to study elements, and argued instead that groupings should follow rather than precede an identification of political and geographic "vertical" relationships referred to earlier by Mr. Lee. Mr. Fisher and Mr. Brown suggested that competing rather than mutually reinforcing requirements of different study elements might form the basis of subcommittee organization; for example, one grouping could combine functions or resource uses requiring restricted water flow such as power and flood control.

The Moderator pointed out that interactions among subcommittees could be anticipated and suggested that consideration of political and

geographic factors and functional relationships would result through a kind of coalescence of the subcommittee.

Priorities and Implementation

A subcommittee on priorities and implementation was recommended, with a later date for reporting than the other subcommittees. In describing the need for this subcommittee Mr. Rouner pointed out that the expression of citizens' priorities would assist regional efforts in obtaining desirable federal investment in resource management. Mrs. Williamson supported the need for this subcommittee stating that unless implementation of the study recommendations was given special attention, the review process would achieve little. Mr. Gossland felt that such a subcommittee should devote itself to the need for a Connecticut River Basin resource management organizational structure, and offer its conclusions as an input to the consideration of study elements by other subcommittees. On the other hand, Mr. Brown felt that organizational structure for implementation ought properly to flow from a consideration first of resource needs. Mrs. Quinn pointed out that organizational considerations could be dealt with as the other subcommittees developed an understanding of the varying implementation needs of different study recommendations, for example, dealing with structural and non-structural flood control.

Ecology

Mr. Lee proposed that a separate subcommittee on ecology be organized to review the study recommendations in terms of their ecological impact, because he felt that the study gives insufficient attention to ecological criteria both in the Main Report and in the appendixes. He specifically noted the absence of a separate appendix of the Report dealing with the subject of ecology, despite its importance, and stated that the Report lacks a solid ecological overview. Therefore, he argued that even if each subcommittee reviews ecological criteria, a separate review of ecological criteria by a single subcommittee could make a substantial contribution. Mr. Sinclair concurred that greater emphasis on ecolgical values was needed and that a separate subcommittee on ecology was needed to provide it. It was generally felt, however, that ecological factors would have to be taken into account by each of the study element subcommittees and particularly by the Subcommittee on Assumptions, Planning Principles and Planning Criteria. Moreover, it was generally agreed that valuable time might be lost in forming another subcommittee that would have to report early to the other subcommittees. Mrs. Quinn suggested that the Subcommittee on Assumptions function as a standing subcommittee on ecology after completing its early report. Mr. Lee said that he would support the creation of a work group on ecology of the Subcommittee on Assumptions.

# MINUTES

**Third Meeting of the Connecticut**
**River Basin Citizens Review Committee**
**Amherst, Massachusetts**
**December 15, 1970**

**David C. Harrison**
**Senior Staff Associate**
**New England River Basins Commission**

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## ATTENDANCE

The third meeting of the CRC convened at 11 a.m., December 15, 1970, in the Bristol-Essex-Hampshire Rooms, Student Union, University of Massachusetts, Amherst, Massachusetts. Members of the Committee attending were:

Professor Bernard B. Berger, Moderator

Connecticut

Betty Brown - Glastonbury
Robert Brown - West Hartford
Barbara Deitrick - Old Lyme
Clyde Fisher - Hartford
Peter Stern - Glastonbury

Massachusetts

Florence Carver - Amherst
Joan Flood - Lenox
Victor Gagnon - Springfield
D. M. Gossland - West Springfield
George Higgins - Amherst
Peter Karalekas - East Longmeadow
Day Lee - Deerfield
Joseph Niquette - Holyoke
Warren Sinclair - Gardner

New Hampshire

Allie Quinn - Hanover
Thomas Rouner - Westmoreland
John Wilson - Lancaster

Vermont

Richard Brett - Woodstock
Judge John Carnahan - Brattleboro
Emery Evans - Brattleboro
Ralph Lehman - White River Junction
Georgie Williamson - Woodstock

Absent were Ellsworth Grant, of West Hartford, Connecticut; Howard Cadwell, of Greenfield, Massachusetts; Rep. Harlan Logan, of Meriden, New Hampshire; Kenneth Reynolds, of Peterborough, New Hampshire; and Sen. Douglas Kitchel, of Passumpsic, Vermont.

The Coordinating Committee for the Connecticut River Comprehensive Water and Related Land Resources Investigation was represented by Lawrence Bergen, New England Division, U.S. Army Corps of Engineers. The New England River Basins Commission was represented by R. Frank Gregg, Chairman, by Malcolm Graf, Staff Director, and by David Harrison, Senior Staff Associate and Administrative Staff Assistant to the Citizens Review Committee. The meeting was open to the public.

## REVIEW OF MINUTES OF MEETING OF NOVEMBER 12, 1970

The minutes of the November 12 meeting were approved with two changes in subcommittee assignments. Mrs. Williamson stated that she had been incorrectly listed as a member of the Subcommittee on Power, and Mr. Lee asked that the minutes be corrected to show that he was a member of the Subcommittee on Water Supply, Water Quality, Flood Control and Navigation.

## ANNOUNCEMENTS

Each committee member had received the full nine-volume Coordinating Committee report. Four special task force reports of the Water Resources Council had been distributed to the Subcommittee on Assumptions, and ten additional sets were brought to the meeting for general distribution. These were:

"Principles for Planning Water and Land Resources" (July, 1970);
"Findings and Recommendations" (July, 1970);
"A Summary Analysis of Nineteen Tests of Proposed Evaluation Procedures on Selected Water and Land Resources" (July, 1970);
"Standards for Planning Water and Land Resources" (July, 1970).

## SPECIAL PRESENTATIONS BY SCIENTISTS

Prior to the business meeting, members of the Committee attended a symposium, "Scientists View of the Corps of Army Engineers' Connecticut River Basin Plans," from 9 to 11 a.m. The symposium was open to the public. The proceedings were taped, and at the Committee Moderator's request the scientists agreed to furnish the CRC with copies of the proceedings which are in the appendices with the exception of Dr. Schuster's remarks which are not available.

The scientists and their affiliations were as follows:

Moderator: Professor F. Bruce Morgan, Acting Dean, Professor of Religion, Amherst College; (Also Former Member of the Mekong River Development Advisory Group.)

Relation of estuarine biology to river flow. Professor William A. Niering, Department of Botany, Connecticut College.

The proposed flood control system and the Meadows Dam. Professor Frank C. Kaminsky, Department of Industrial Engineering and Operational Research, University of Massachusetts.

Effects of flood control dams on upstream vegetation, landscape, and existing recreational areas. Professor R. M. Schuster, Department of Botany, University of Massachusetts.

Hydrological significance of the flooding cycle of the Connecticut River. Professor Ward Motts, Department of Geology, University of Massachusetts.

Biology of the annual flow cycle of the Connecticut River. Professor Lincoln P. Brower, Department of Biology, Amherst College.

After the presentations, but prior to the business meeting, members of the Committee addressed the following questions to the panelists.

Had Professor Kaminsky discussed with the Coordinating Committee his analyses of the flood damage risk associated with each major population center in the Connecticut River Valley? Professor Kaminsky replied that he had discussed data with the Coordinating Committee but not methodology. He noted that his and the Coordinating Committee's risk analyses had possibly been derived from different data.

Would Professor Motts' allusion to erosion/siltation problems caused by flood control reservoirs have been illuminated more fairly by reference to the Androscoggin River-- or to some other Connecticut River tributary-- than to the Aswan dam on the Nile River in Egypt? Professor Motts replied that each river has its own characteristics, but in general the damming of the Nile effectively contrasts the environmental and associated economic, social and other benefits of designing with nature-- by permitting natural flooding of flood plains-- with the environmental costs of dams.

Professor Brower was asked whether it was fair to compare the benefits of flood control-- measured in terms of basin property values ($26 million) that lack adequate protection-- with the cost of implementing the entire study ($1.8 billion), which includes a broad range of resource management recommendations unrelated to flood control. Professor Brower replied that the comparison was not unfair, considering that $700 million of the projected $1.8 billion program costs was attributable to power production, which is intimately tied in with flood control dams. The Moderator said that he would send a formal note of thanks to the panelists on behalf of the CRC.

## PRELIMINARY REPORTS OF THE SUBCOMMITTEES

Subcommittee chairmen presented draft subcommittee reports. The Moderator invited comments first from the subcommittee members, and then requested that the full Committee provide specific guidance to the subcommittees for preparation of their final reports. Comments are summarized below. (next page)

## SUBCOMMITTEE ON ASSUMPTIONS, PLANNING PRINCIPLES AND CRITERIA-- MR. GOSSLAND

1. Weighting planning criteria

> It is suggested that the Citizens Committee as a whole could refer the problem of determining the criteria for establishing optimal balances of population, economic activity, social well-being, and environment for different regions to a court of higher review-- even above the level of the Water Resources Council. -- Subcommittee report, p. 4, paragraph 3.

Mr. Gossland explained that by "court of higher review" he had in mind a national policy determination-- by the President and Congress-- that would avoid leaving to local interests major responsibility for weighting the planning criteria. He noted that in its special task force reports the Water Resources Council had carefully avoided weighting the four criteria for national efficiency, regional development, environmental quality and social well-being. He stressed the need, therefore, for an established methodology for weighting these criteria regionally, which would simplify the CRC's and similar groups' task of providing regional plan evaluations. He felt in particular that the proposed Water Resources Council standards, through extraordinarily well written, still leave too much responsibility to the local level. Mr. Stern wondered whether the National Water Commission might accomplish this national weighting of water planning criteria, while Messrs. Rouner and Wilson argued that the CRC should nonetheless be free to assert its own judgment.

2. Emphasis on environmental quality

> It is clear from the heavy emphasis on structural programs that environmental quality has been relatively downgraded. -- subcommittee report, p. 5, paragraph 3.

Mr. Rouner questioned whether heavy emphasis on structural programs that include major expenditures for fish and wildlife and water quality facilities can be generally condemned as being discriminatory against environmental quality. Mrs. Quinn agreed that there tends to be an association between structural solutions and deterioration of environmental quality. She recommended, however, that the statement be clarified to call attention to the need for greater emphasis on nonstructural solutions rather than to environmental quality. Mr. Gagnon, who was identified as the source of the statement, argued that the study was insufficiently attentive to the environmental impact of its major proposals, particularly for major reservoir

construction, and that this was accentuated by the change in Congressional emphasis on environmental affairs since 1962, the first year of the study. He pointed out that the environmental impact of the plan is generally unknown, and therefore lay analysis of specific proposals requires additional research of a basic nature.

3. Civilian economy vs. national defense priorities

> Further questionable assumptions... relate to ... 4. A continuation of the current relative needs of the civilian economy and the national defense. It would be instructive if the subcommittee on priorities and implementation could provide a breakdown on these relative needs in time to provide the subcommittees on the various functional elements of the Connecticut River Basin Study with a feel for the figures allocated to their respective elements of responsibility.
> -- subcommittee report, p. 6, paragraph item 4.

Mr. Gossland explained that the statement directly questioned the assumption on p. V-2 of the Coordinating Committee report that current relative needs of the civilian economy and the national defense would remain essentially unchanged for the period 1960-2020. He disqualified himself from taking part in a committee recommendation on national priorities, by reason of being a Canadian citizen. Mr. Gregg offered to provide federal budgetary information that would reflect national priority breakdowns in terms that the CRC could respond to. (Note: copies of the Federal Budget in Brief: Fiscal Year 1971 were distributed to the Subcommittee on Priorities and Implementation December 18.) Mr. Rouner felt that the question ought to be referred to the Committee as a whole rather than to his subcommittee on priorities.

4. Independent environmental evaluations

Mr. Gregg pointed out that federal agencies with responsibility for implementing study proposals would be required under the provisions of the National Environmental Policy Act of 1969 to submit statements on projects' environmental impact-- and possibly on the full Coordinating Committee report itself-- to the Environmental Quality Council. Mr. Bergen stated that the New England Division, Corps of Engineers, would be required under the act to submit detailed, very specific reports on the environmental effects of Corps projects recommended in the report; he added that an environmental advisory unit had been created within the Corps to meet this statutory requirement. It was noted, however, that comparable reviews are not required

by the states. Moreover, Mr. Lee and Mr. Gagnon stressed the desirability of environmental evaluations by agencies that are not vested with project management responsibilities.

5. Ongoing planning mechanisms

Mr. Fisher recommended that, rather than attempt an evaluation of individual projects, the CRC's final report focus on the Committee's concerns with objectives and procedures for project planning, management and development. Specifically, he recommended that the Committee's report focus upon mechanisms for ongoing planning that would incorporate citizens involvement throughout the project planning process rather than restricting it to the final 90 days. The Moderator asked that Mr. Fisher prepare a statement reviewing the experience of the CRC for presentation at the next regular CRC meeting January 14.

6. Plan duration

Mrs. Flood recommended the addition of a new item f) to page 2 of the draft subcommittee report, limiting future basinwide resource studies like the Connecticut River study to three-years' duration. (Note. The Water Resources Council intends to limit future river basin studies of the Connecticut River type (type II, since redesignated Level B) to three years. One reason given is the need to reduce the requirement for technical detail in comprehensive basin studies. Detailed project planning will be the responsibility of individual agencies.)

Mr. Gossland requested that the above points (numbered one through seven) be summarized in the minutes for discussion by the Subcommittee on Assumptions as a special subcommittee meeting.

## SUBCOMMITTEE ON POWER - MR. HIGGINS

1. Environmental impact -- demand for electricity

> The major criticism of the Connecticut River Basin Plan from the subcommittee would seem to be the failure of the report to emphasize that the $700 million allocated for power (of the total $1.8 billion) does not constitute a Federal expenditure. Presumably the public would pay for this and should be made aware of the consequences of increased power demands both with regard to regional economies and impact upon the environment.
> -- subcommittee report, p. 2, paragraph 2.

> Any suggestion that reduction in electric power in the 1970's would decrease the volume of facilities and thereby reduce the environmental impact may be self-defeating.... Such a move would increase the demand for other products or forms of energy which may have an equal or greater effect on the environment. Overt efforts to discourage power production by way of the market mechanism may have side effects that few would wish to encourage.
> -- subcommittee report, p. 1, paragraph 2

Mr. Wilson recommended that the subcommittee consider the possibility that rationing of electric power may be proposed to reduce pressures for electric power generation on the one hand and to improve environmental quality on the other. He feared that population growth, rising personal income and other trends could push power demands beyond environmentally manageable limits. Mr. Brett objected to the subcommittee report's either-or approach, i.e. either projected power needs will be satisfied or power consumers will have to turn to sources of power that are even more environmentally risk-laden than electricity. He felt that Mr. Higgins' statement should instead recognize the need to curb certain frivolous uses of power in the interest of safeguarding human survival, the requirements of which ought to be restated. Mr. Gagnon agreed, and added that the task of the Subcommittee on Power, and all of the study element subcommittees, should be to consider the long term environmental impact of the report's proposals. Mrs. Flood stated that the subcommittees would have time only to raise the questions Mr. Gagnon raised but would not have time to provide answers; moreover, she questioned whether each subcommittee should have to make a separate or special inquiry into environmental impact. Mr. Higgins said that the subcommittee report avoided an unrealistic presentation of the options open to the power consuming public, and to support this he referred to the statement on page 1, paragraph 2, of the report, that "the desirable goal would seem to be determination of the optimum mix of the power sources for proper balance of the technological and ecological factors." Mr. Gossland noted that the projected power demand was

many times the projected population growth, and asked whether this projection needed substantiation. Mr. Stern answered that the figures could be conservative. He observed that the Connecticut River Valley is a high income area, and this, as well as population growth and frivolous power consumption, constituted an important factor in increasing power demand. He wondered whether the rising unit price for power would not have the desired limiting effect on demand, whether or not other measures take effect, such as power rationing, redistribution of income and population control. He noted further that the demand for electricity was still expanding at an annual rate of nine percent, even in the economic recession year 1970. Mr. Gregg offered to distribute to the subcommittee copies of a report that dealt with these questions. (Note: the report, which was distributed to the subcommittee December 18, is entitled A Study of the Electric Power Situation in New England, 1970-1990 (Sept., 1970). It was prepared for the New England Regional Commission by H. Zinder & Associates, Inc.)

2. Low flow augmentation

> Points of agreement.... Require continued passage of any added augmentation.
> -- minutes, Power Subcommittee meeting 11/24, p. 2, item 3, paragraph 3

It was suggested that the remark be clarified to exclude power generation as a purpose of low flow augmentation. Mr. Higgins emphasized that the remark referred to water quality and did not constitute an endor sement of augmentation for power. Mr. Bergen noted that low flow augmentation was a minor benefit of the proposed Victory Dam.

3. Minimum flow rate

> Points of agreement:... We endorse a guaranteed minimum flow of 0.2 cfs/sq. mi. and indicate our endorsement of such in the relicensing of power dams and operation of any other dams.
> --minutes, Power Subcommittee meeting 11/24, p. 2, item 3, paragraph 2

Mr. Gregg asked whether the subcommittee had considered the question of compensating dam owners required to provide a minimum flow of 0.2 cfs/sq. mi., whose dams do not come up for relicensing until 1990. Mr. Higgins stated that the question would be considered in the subcommittee's final report. Mrs. Quinn stated that her subcommittee on water supply, etc., considered questions of equity too complicated to support a strong recommendation without

more specific information than is contained in the Coordinating Committee reports on purposes associated with minimum stream flow. Mr. Bergen explained that the 0.2 cfs/sq. mi. figure was recommended by the Coordinating Committee subcommittee on stream flow regulation, and was based on the average seven-day low flow consistent with the protection of anadromous fish in Connecticut River tributaries. The figure could be different-- members of the stream flow subcommittee suggested 0.36 cfs./sq. mi. -- depending on the subject area. Mr. Karalekas agreed that determining a figure for optimum low flow could constitute a separate study in itself. He also mentioned that a requirement of 0.2 cfs/sq. mi. would affect existing water supply developments such as the Littleville reservoir.

4. Applicability of the Environmental Policy Act of 1969

The Moderator asked for clarification of how the Environmental Policy Act of 1969 applied to private power structures. Mr. Stern said that evaluations of the environmental impact of such structures are required by the Federal Power Commission. Mr. Gagnon added that federal licensing agencies for such structures are required by the act to take environmental impact into account. Mr. Gregg offered to distribute copies of relevant background documents to the Power Subcommittee, entitled Laws and Procedures of Power Plant Siting in New England, Report No. 1 (NERBC, February, 1970) and Electric Power and the Environment (Executive Office of the President, Office of Science and Technology, August, 1970). (Note. these were distributed to the Subcommittee on Power December 18.) He noted that the NERBC report on power plant siting in New England concluded that the first line attempt to improve procedures for power plant siting should be at the state level. He suggested, therefore, that the subcommittee might inquire into alternative institutional arrangements for implementing this recommendation. Mr. Stern emphasized that any institutional arrangements for environmental evaluation of power plant siting providing for one-step review and approval would be welcomed by the utility industries.

## SUBCOMMITTEE ON WATER SUPPLY, WATER QUALITY, FLOOD CONTROL AND NAVIGATION

### Flood control

#### 1. Risk evaluation

> The subcommittee has no clear understanding as to why or which new large impoundments are essential.
> --subcommittee report, p. 4, paragraph 3

Mrs. Quinn commented on the difficulty of evaluationg the risks of flooding and stressed the need to design a flood management program based on an acceptable level of risk. Mr. Gregg suggested that this concern might be expressed in the subcommittee report.

#### 2. Upstream-downstream trade-offs

Mr. Brett stated that flood control studies neglect the loss to downstream urban dwellers of open space for recreation caused by upstream reservoir construction. Mrs. Quinn expressed concern in regard to low flow augmentation and assumed that there is a difference between low flow augmentation and flow regulation. She wondered about providing for low flow augmentation from upstream reservoirs rather than the larger dams. Mr. Gregg noted that much information has been published in regard to upstream-downstream tradeoffs, and offered to distribute relevant documents to the subcommittee. (Note: The Flood Control Controversy, by Leopold and Maddock (The Ronald Press Company, New York, 1954) was loaned to Mrs. Quinn December 17.)

#### 3. Protection for existing vs. future development

Mrs. Quinn expressed uncertainty of the extent to which the recommended flood control program is intended to protect existing as opposed to future development of the flood plains. She wondered how much existing development might justifiably be removed to alleviate the need for flood protection. Mr. Stern noted that the state of Connecticut has undertaken a study of flood plain encroachment in the Connecticut River Valley. Mr. Gregg suggested that the subcommittee comment on the NERBC report, Flood Hazard Area Management for New England, prepared by Anderson-Nichols & Co., Inc., (Dec., 1970). (Note: this report was distributed to the Subcommittee on Water Supply, etc., prior to the December 15 meeting, and to the remainder of the full Committee December 21.)

4. Compatibility of multiple uses

> The justification (of multi-purpose dams) depends upon the collective benefits of purposes which... may not be compatible. Flood control, water supply, flow augmentation and recreation within a single reservoir are all competing and probably in the long run mutually exclusive uses.
> --subcommittee report, p. 4, last paragraph

Mr. Wilson pointed out that there could be exceptions where multiple uses are compatible. Mr. Brett, however, emphasized the probability that such uses-- e.g., flow augmentation, environmental protection and recreation where periodic drawdowns occur-- would be incompatible, and recommended that primary purposes of water storage projects be identified and closely adhered to in order to avoid abuse of the resource.

5. Alternative measures

> The (subcommittee) has no clear understanding as to ... what alternative measures are feasible (other than large multi-purpose dams).
> --subcommittee report, p. 4, paragraph 3

Mr. Brown stated that the CRC Connecticut members are uncertain whether flood control measures other than protection from further flood plain encroachment are necessary. He felt that inadequate discussion of alternative measures for flood control is a major omission in the Coordinating Committee report, and recommended that the subcommittee report call for discussion specifically of alternatives other than upstream flood control structures.

6. Subcommittee positions on individual projects

Mr. Lee was identified as chairman of a subcommittee task group responsible for preparing a statement of subcommittee positions on individual flood control projects. The Moderator asked for copies of the statement to distribute to the Committee as soon as it was finished. He added that the Committee should develop positions on individual flood control projects prior to meeting with the Coordinating Committee January 11. Committee members who do not concur with the statement prepared by Mr. Lee's task group were asked to telephone their comments to the Moderator.

Water Supply

7. Ground water supply

> The subcommittee recommends that a staged program be set up for determining available yield of ground water sources in the basin and for protecting these sources as defined.
> -- subcommittee report, p. 2, paragraph 4

Mr. Brown suggested that the recommendation include an assessment of the impact on the environment of large-scale ground water use.

8. MDC Diversion

> The Subcommittee feels that the concept of controlled diversion of truly surplus waters is reasonable and supports the sharing of such waters from the Connecticut River as proposed in the Northfield Mountain pump storage project. However, this is conditional upon... establishing a quid pro quo such as expanding recreation on Quabbin Reservoir in return for that reservoir's receiving surplus Connecticut River waters.
> --subcommittee report, p. 2, paragraph 5

Mr. Brown recommended that the subcommittee add to its statement on diversion the request for an immediate determination of whether it is feasible to supply water to the Springfield-Hartford metropolitan areas from the Quabbin reservoir. He also suggested that a determination be made whether low flow augmentation in addition to water supply might be a quid pro quo for diversion. Mr. Fisher wondered whether Quabbin Reservoir might be operated in a way that would benefit downstream Connecticut River users at times of low river flow.

Water Quality

9. Pollutants

> The subcommittee strongly supports the recommendations for further detailed study of certain pollution problems, particularly those associated with phosphates and nitrates, mercury, pesticides, sludge accumulations, and thermal discharges.
> --subcommittee report, p. 3, paragraph 4

Mr. Brown suggested that water borne viruses be added to the list of pollutants.

SUBCOMMITTEE ON RECREATION, ANADROMOUS FISH, RESIDENT FISH, AND WILDLIFE AND SITE PRESERVATION -- MRS. CARVER

1. Opening public water supplies for recreation

Reference was made to page 1, item 1 of the subcommittee report dealing with the use of public water supplies for recreation. Mr. Karlekas informed the Committee that Massachusetts law prohibits bathing in any water supply reservoir and makes local boards of water commissioners individually liable for contamination of public water supplies. He felt that if the Committee recommended allowing bathing in any Massachusetts water supply reservoir, it would be necessary to amend or repeal the existing laws. He argued strongly against opening Quabbin Reservoir up to recreational uses, on the grounds that. 1) the reservoir would then require costly purification treatment; 2) heavily treated water has an unpleasant taste compared with the present water supply; and 3) it would be unfair to compel the metropolitan Boston community to drink treated water so that a small fraction of the population could recreate on Quabbin Reservoir. Mr. Karalekas argued instead that recreational use of secondary reservoirs be recommended, where existing law permits water commissioners the discretionary use of regulatory powers with respect to boating and fishing. Mr. Gossland said that studies had shown that multiple use management of domestic water supply resources can be implemented without dangerous deterioratinn of the water quality required for suitable levels of potability and health. (Note. Mr. Gossland cited "The Recreational Use of Watersheds," in Sport Fishing Institute Bulletin, No. 171, February, 1966, cited in Capitol Region Planning Agency, Open Space Plan for the Capitol Region, (December, 1966), p. 52.) The moderator stated that the issue had arisen because of the New England tradition of not using water supply reservoirs for recreation/water contact sports even though studies had shown that no harm results. Mr. Gossland urged Committee support of large multi-purpose reservoirs that help to alleviate the critical shortage of water for recreational use in New England. Mr. Gregg suggested that the subcommittee might comment on the degree to which large dams having recreational use as a principal benefit meet projected regional outdoor recreation demand. Mrs. Carver explained that the subcommittee's final report would cover this subject, although generally matters pertaining to dam construction were left to the Subcommittee on Water Supply, etc.

2. Anadromous fisheries

Reference was made to page 1, item 3B of the subcommittee report dealing with anadromous fisheries, improvement of fish ladders. Mr. Stern questioned whether the expense of fish ladder improvement or installation-- which could run from $2 to $4 million-- should be charged to the public. If questions of equity could be settled, he said, the industry has no objections to providing fish ladders.

Recreation

3. Recreational zoning

Reference was made to page 2, item 4B of the subcommittee report recommending that recreational areas be zoned. Mr. Brett suggested adding zoning by time of day as well as area.

4. Statement on individual proposals

The Moderator requested a statement setting forth a subcommittee position on individual proposals comparable to Mr. Lee's statement on flood control projects, where subcommittee opposition is indicated. Mrs. Carver indicated that such a statement would be prepared with specific reference to elements of the Bureau of Outdoor Recreation National Recreation Area proposal, "New England Heritage."

SUBCOMMITTEE ON UPSTREAM WATER AND RELATED LAND RESOURCE POTENTIAL - MRS. DEITRICK

Mrs. Deitrick stated that the draft report of the subcommittee would be submitted to the Moderator for distribution to the full Committee during the week of December 21. Mr. Gregg suggested that the subcommittee consider Coordinating Committee proposals relating to national forest land acquisition, particularly in the Green and White mountains. He saw no reason for the Committee to study the details of the Public Land Law Review Commission report. Mr. Lee wondered whether the total acreage taken up by 118 proposed small dam projects would turn out to be fairly large in comparison with large dams. He suggested that the area and shoreline perimeters of many small projects might have a significant effect on the environment. Mr. Sinclair felt that the report contained too little information on these projects to provide a basis for judgment either for or against the projects.

SUBCOMMITTEE ON PRIORITIES AND IMPLEMENTATION - MR. ROUNER

The Subcommittee on Priorities had agreed at the previous Committee meeting to defer most of its work until after the December 15 meeting. However, Mr. Rouner read a preliminary statement.

The Moderator asked for Committee suggestions to guide the work of the Priorities Subcommittee. Following is the Committee's response.

Mr. Gagnon suggested.

THAT the subcommittee develop a statement of priorities among projects and values;
THAT the subcommittee recommend a citizens review of each individual major project as it progresses through the implementation process; and
THAT the Subcommittee recommend that the authority of NERBC be expanded to include police powers or, in the alternative, consider the creation of an interstate compact.

Mrs. Flood agreed with Mr. Gregg that the subcommittee should consider recommending delay rather than abandonment of major reservoir projects in order to protect their unique sites for possible reservoir use in the future. Mrs. Quinn noted that project delays complicate other important development decisions relating, for example, to highway and rail transportation construction. Mrs. Flood urged the full Committee to read two publications that had been distributed to the Committee: League of Women Voters Committee for the Connecticut River Basin, Institutional Arrangements for Management and Development of Water Resources (March, 1968); and A Proposal for Water Resources Management in the Connecticut River Basin, a report to the Coordinating Committee of the Connecticut River Basin Water Resources Investigations by the Ad Hoc Committee on Institutional Arrangements (May, 1969).

Mrs. Quinn requested recommendations concerning institutional arrangements for Connecticut River Basin water resource management, particularly in reference to the MDC diversion project.

Mr. Gossland asked for an indication of which types of planning proposals or study elements could be implemented by permissive or mandatory legislation. Mr. Graf stated that water quality was the only element where specific mandatory legislation was applicable, and that it is a relatively recent development.

Mr. Karalekas urged the subcommittee to consider groundwater supplies second on its list of project priorities.

Mr. Niquette offered to send copies of Chapter 71 of the Resolves of 1970 (Mass.) to the subcommittee (Note: NERBC mailed these to the CRC 12/21) members. He stated that this legislation created a Connecticut River Basin legislative study commission which was directed to study the feasibility of creating a Connecticut River Basin District Council within the Massachusetts portion of the basin. He noted that the Governor of Massachusetts had not yet made his appointments to the study commission; that the commission had a budget of $50,000; and its chairman was State Rep. Chmura.

Mr. Rouner commented in reply that he felt that NERBC's proposed Connecticut River Basin Program (CRBP) should be the agency to oversee future study planning, coordination and implementation. He did not, however, rule out the possibility that an interstate compact might be needed. He stated that the legislative authority of NERBC could not be expanded in any way that would encroach upon the constitutional prerogatives of the states. He particularly wanted the subcommittee to focus on suggestions that would be helpful in implementing unquestionably desirable study proposals, working within the existing organizational framework. Mr. Rouner questioned whether NERBC has the authority to make decisions with respect to the proposed projects.

Mr. Gregg said that in his opinion the people of the Connecticut River Basin could have any kind of water management institution they wanted, but only if they wanted it badly enough. He felt that there is a heavy burden of proof on anyone arguing in favor of creating a new institution, because the likelihood

that a new institution can alter the balance of power between existing institutions or alter deep political conflicts is extremely small. Moreover, he noted that the stronger the new institution proposed the greater the difficulties of bringing about its creation. Of 20 to 30 interstate organizations funded wholly or in part by the New England states, Mr. Gregg said, NERBC alone received full funding from the states. The subcommittee should consider the difficulties of obtaining funding for a new institution from the four basin state legislatures and from Congress; he was uncertain whether NERBC's CRBP would be adequately funded, for example, by three of the four New England states. If, however, the subcommittee recommended the creation of a new regional basin management organization, he urged consideration of several variables, based in part on a reading of the materials mentioned by Mrs. Flood. He felt it was conceivable that NERBC could be empowered by Congress to pass judgment on federal projects, for example under the provisions of the Environmental Policy Act of 1969 requiring submission of environmental evaluations of federal projects to the Environmental Quality Council. However, Congress could not assign regulatory powers to NERBC that the states already exercise under their own constitutions; cooperative action in this area would require an interstate compact. He observed that no federal agency unilaterally allocates the water and related land resources of any single river or river basin.

The next subcommittee meeting was scheduled for Monday, December 28, 9 a.m. at the University of Massachusetts Campus Center, Room 802, immediately preceding a meeting of the Subcommittee on Power.

DISCUSSION OF NEED FOR SPECIAL MEETINGS

The Moderator stated that a CRC meeting with members of the Coordinating Committee was to be arranged to offer the Coordinating Committee an opportunity to comment on the CRC's preliminary recommendations. (Note. The meeting is arranged for 10 a.m. Monday, January 11, rooms 165-169, Campus Center, University of Massachusetts, Amherst. An agenda will be distributed by December 24, if possible.) It was explained that the findings and recommendations of NERBC member agencies and states are due to be submitted to NERBC February 1, the same deadline applicable to the CRC, and as a result it would not be possible for the CRC to obtain these in time to affect its own review except in a few cases where the reviews would be submitted in advance of that date. Mr. Harrison offered to distribute such reviews to the CRC as soon as they were received.

DISCUSSION OF AGENDA ITEMS FOR THE JANUARY 14 MEETING

The Moderator requested committee suggestions for agenda items for the January 14 CRC meeting by mail.

The Committee adjourned at 4.25 p. m.

# SUMMARY OF MINUTES

Special Meeting of the Connecticut River Basin
Citizens Review Committee with the
Connecticut River Basin Coordinating Committee

Amherst, Massachusetts
January 11, 1971

David C. Harrison
Senior Staff Associate
New England River Basins Commission

Attendance, Coordinating Committee

U. S. Department of Agriculture
Everett R. Clark, Soil Conservation Service (Durham, N.H.)
Charles H. Dingle, Soil Conservation Service (Durham, N.H.)
Keith Grest, Forest Service (Portsmouth, N.H.)

U. S. Army Corps of Engineers
Col. Frank P. Bane, New England Division
Lawrence J. Bergen, New England Division
Joseph L. Ignazio, New England Division
John William Leslie, New England Division

Environmental Protection Agency
Clyde Shufelt, Federal Water Quality Administration

Federal Power Commission
Paul H. Shore

U. S. Department of the Interior
Mark Abelson
Katharine Harbison, Bureau of Ourdoor Recreation (Philadelphia, Pa.)
Charles E. Knox, U.S. Geological Survey
George A. Palmer, National Park Service
Ralph A. Schmidt, Bureau of Sport Fisheries and Wildlife
Norrel Wallace, Bureau of Sport Fisheries and Wildlife (Concord, NH)

New England River Basins Commission
Malcolm E. Graf

Absent: U. S. Department of Commerce; U. S. Department of Health, Education and Welfare; Connecticut; Massachusetts; New Hampshire; and Vermont.

Attendance, Citizens Review Committee

Professor Bernard B. Berger, CRC Moderator and Chairman of the special meeting.

Betty Brown - Glastonbury, Connecticut
Howard Cadwell - Greenfield, Massachusetts
Florence Carver - Amherst, Massachusetts
Barbara Deitrick - Old Lyme, Connecticut
Clyde Fisher - Hartford, Connecticut
Joan Flood - Lenox, Massachusetts
D. M. Gossland - West Springfield, Massachusetts
G. R. Higgins - Amherst, Massachusetts
D. Day Lee - Deerfield, Massachusetts
Joseph Niquette - Holyoke, Massachusetts
Allie Quinn - Hanover, New Hampshire
Thomas Rouner - Westmoreland, New Hampshire
Warren Sinclair - Gardner, Massachusetts
Peter Stern - Glastonbury, Connecticut
John Wilson - Lancaster, New Hampshire

Absent: Robert Brown and Ellsworth Grant, of West Hartford, Connecticut; Victor Gagnon of Springfield and Peter Karalekas of East Longmeadow, Massachusetts; Harlan Logan of Meriden and Kenneth Reynolds of Peterborough, New Hampshire; and Richard Brett of Woodstock, Judge John Carnahan of Brattleboro, Emery Evans of Brattleboro, Sen. Douglas Kitchel of Passumpsic, Ralph Lehman of White River Junction, and Georgine Williamson of Woodstock, Vermont.

The NERBC was represented by Mr. Graf, who sat with the Coordinating Committee, and by David Harrison, Senior Staff Associate and Administrative Staff Assistant to the Citizens Review Committee.

Subcommittee on Assumptions, Planning Principles and Criteria

Effective citizens' participation in future Connecticut River Basin planning requires adequate and early release of public information concerning basin plans. The CRC should volunteer to serve as a citizens advisory board to the proposed NERBC Connecticut River Basin Program (CRBP). The CRBP will require professional public relations staff capability. - Mr. Gossland

The findings and recommendations of the CRC subcommittee reports are objective. Disagreements are the result of the CRC's not having been established at the start of the Connecticut River study so that it could have worked with the Coordinating Committee throughout the study. - Col. Bane

The main thrust of the CRC's efforts should be in public education/communication - bridging the credibility gap between the Coordinating Committee and the public. - Mr. Ignazio

It is up to the citizens of the Connecticut River Valley to tell NERBC what they think NERBC ought to be doing in the Valley through the proposed CRBP. - Mr. Abelson

Granted that econometric/simulation studies of the Basin are needed, where is the money to pay for such studies? - Mr. Stern

Subcommittee on Power

The Federal Power Commission will agree with the CRC Power Subcommittee in its comments to NERBC on the Connecticut River study that the estimated $700 million cost of power development projects should not have been included in the total study implementation cost, because as a private sector item it is misleading as to the total public cost of the entire program. - Mr. Shore

Discussion of .2 csm minimum flow recommendation of the Coordinating Committee report should distinguish between stream flow regulation and low flow augmentation, since separate purposes and effects are involved. The present well tuned flow regulatory system, with existing storage, is operating at 95% efficiency to generate peaking power. - Mr. Ignazio

The purpose of .2 csm minimum flow is not to insure smooth flow but to avoid no flow, and on some tributaries even .2 csm is too high. It is doubtful whether upstream reservoirs increase downstream main stem flow, particularly with correct timing for the need. Mr. Knox and Mr. Graf

If the purpose of low flow augmentation is not partly to benefit power production, this should be made clear in the Coordinating Committee report. The report indicates that one purpose of the Victory reservoir, for example, would be to benefit power production by low flow augmentation. - Mr. Lee and Mr. Shore

It was alleged at a meeting of Conservation Commissions in Springfield, to protest the Coordinating Committee report and the CRC, that a principal purpose of the Coordinating Committee report is to benefit power interests. However, the power development element is relatively separable from the remaining elements of the Early Action Program. - Mr. Fisher This illustrates the need for public information/communication. - Mr. Ignazio

The horizontal organization of the report is a main source of confusion. Without cross-referencing throughout the report, or vertical organization, there is no easy reference to the power element or any of the other elements in the report. - Mr. Lee Cross-referencing was considered but was not attempted because of lack of time and money in the Coordinating Committee's budget. - Mr. Leslie

Legislation would be necessary to control demand for power. It could not be accomplished by altering the rate structure. - Mr. Shore

Subcommittee on Water Supply, Water Quality, Flood Control and Navigation

CRC has no feeling for the level or degree of acceptable risk of floods/flood damage. Analytic techniques for assessing the need for flood control measures are at best an imprecise art. Additional analysis is needed of the loss of economic, ecological and social opportunities at the local level caused by flood control reservoirs. A favorable benefit-cost ratio is not a measure of the desirability of a flood control project. It is a federal/national question whether protection should be provided against potential damage from a standard project flood (SPF). Any flood control reservoir must be recommended in reference to the need for flood plain management. The main issue is one of competing national needs/priorities. A better sense is needed of the probability of the flood damage the study's recommendations are designed to protect against. - Mrs. Quinn

The public is not likely to understand or to accept the meaning of SPF or the need for protection of 25% of the watershed above Hartford. The time range for SPF is too far. - Mr. Lee

It was a mistake to mention SPF in the Coordinating Committee report. No reservoir is built for a single storm or flood. Project benefits will accrue over the 100-year life of the project; SPF is not necessary for a dam to pay off. Dams have to be designed to handle the worst reasonable conditions. The money has to be spent because otherwise the devastation would be horrendous. This does not mean that the entire Basin flood control plan must be accepted. - Mr. Leslie

Flood control reservoir priorities should be (1) Meadow Dam, because it is essential to protect the economic heart of the Valley; (2) Gaysville; (3) Claremont; and (4) Bethlehem Junction.... Tools to implement the BOR plan and flood plain protection are available at the state and local levels. - Mr. Ignazio

Flood control reservoirs are built when floods occur and a crisis atmosphere develops. The CRC should take advantage of its opportunity to consider alternatives to flood control reservoirs and among flood control reservoirs because damaging floods have not occurred recently. The SPF concept and the rule of thumb used to gauge the extent of flood control protection needed - control of 25% of the watershed above Hartford - are neither inviolate. These are useful, rough concepts for planning purposes; their acceptance should not be necessary for acceptance of the study's structural flood control recommendations. The 25% protection figure refers more precisely to control of peak contribution of the tributaries. - Mr. Graf

NERBC will have to resolve questions of competing priorities, specifically whether the cost of implementing the study's structural flood control recommendations is warranted in terms of the probable risk to be protected against. - Mr. Rouner

Structural flood control measures are 30% oriented to flood control. Seventy percent of their total benefits are environmental. The principal value of the 25% flood protection figure is that it compelled a regional view of basin flooding problems. - Mr. Leslie

The basic problem regarding diversion of river water for out-of-basin water supply is not the adequacy of water supply but fear and ignorance. - Mr. Ignazio

Subcommittee on Upstream Water and Related Land Resource Potential

The Coordinating Committee hadn't the time or money to evaluate the environmental impact of the proposed 118 small (PL 566) reservoir sites. - Mr. Dingle

Subcommittee on Priorities and Implementation

If the proposed Connecticut River Basin Program of NERBC is not adequately funded, it is critically important to know whether NERBC can then accomplish the objectives of the program with funds allocated to operating or other expenses. While the membership of the Coordinating Committee is still intact, it should prepare a swan song that would tell of its experience, identify the major problems encountered during the preparation of the report, and assist successor organizations in carrying various phases of the report through to implementation. - Mr. Rouner

The proposed CRBP budget is $140 thousand, to be equally shared between the federal government and the basin states; this amount is less than what will be needed to carry out the objectives of the program. NERBC was slow in accepting the Coordinating Committee's recommendation for a CRBP because of the difficult state funding problems, and is reluctant to ask the basin states to contribute more toward the cost of the program. - Mr. Graf

# MINUTES

Fourth and Final Meeting of the
Connecticut River Basin Citizens Review Committee

Amherst, Massachusetts
January 14, 1971

David C. Harrison
Senior Staff Associate
New England River Basins Commission

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ATTENDANCE

The fourth and final meeting of the Connecticut River Basin Citizens Review Committee (CRC) convened at 11 a. m. January 14, 1971, in the Bristol-Essex-Hampshire rooms, Student Union, University of Massachusetts, Amherst, Mass. Members of the Committee attending were:

Professor Bernard B. Berger, Moderator

Connecticut
- Betty Brown - Glastonbury
- Robert Brown - West Hartford
- Clyde Fisher - Hartford
- Peter Stern - Glastonbury

Massachusetts
- Howard Cadwell - Greenfield
- Florence Carver - Amherst
- Victor Gagnon - Springfield
- D. M. Gossland - West Springfield
- G. R. Higgins - Amherst
- Day Lee - Deerfield
- Joseph Niquette - Holyoke

New Hampshire
- Allie Quinn - Hanover
- John Wilson - Lancaster

Vermont
- Richard Brett - Woodstock
- Emery Evans - Brattleboro
- Ralph Lehman - White River Junction

Absent were Barbara Deitrick, of Old Lyme, and Ellsworth Grant, of West Hartford, Connecticut; Joan Flood, of Lenox, Peter Karalekas, of East Longmeadow, and Warren Sinclair, of Gardner, Massachusetts; Harlan Logan, of Meriden, Kenneth Reynolds, of Peterborough, and Thomas Rouner, of Westmoreland, New Hampshire; and John Carnahan, of Brattleboro, Douglas Kitchel, of Passumpsic, and Georgie Williamson, of Woodstock, Vermont.

The NERBC was represented by Malcolm E. Graf, Staff Director, and by David C. Harrison, Senior Staff Associate and Administrative Staff Assistant to the CRC. The meeting was open to the public. Observers who identified themselves included Dr. John Brainard, of Springfield College and the Springfield Conservation Commission; Burnham A. Judd, Selectman, Town of Pittsburg, New Hampshire, accompanied by Mr. Randolph, of Pittsburg; Professor Lincoln Brower, of Amherst College; Paul R. Kokonowski, Administrative Aide to Congressman Edward P. Boland, of Massachusetts; Pat Delo, of the Springfield Daily News; and Joseph Gurvitch, former Chairman of the Springfield Conservation Commission.

## DISCUSSION OF MINUTES OF COMMITTEE MEETING OF DECEMBER 15, 1970

The minutes of the December 15, 1971, meeting were approved with two typographical corrections; page 3, first paragraph, "damning" was corrected to read "damming;" page 2, last paragraph, "Committee's" was corrected to read "Committee his."

## ANNOUNCEMENTS

Mr. Graf announced that NERBC Chairman Gregg had a conflicting commitment and regretted that he was unable to attend the final CRC meeting.

## COMMENTS ON THE SPECIAL CRC MEETING WITH THE COORDINATING COMMITTEE, JANUARY 11, 1971

Mr. Harrison read a summary of minutes of the special CRC meeting with the Coordinating Committee of January 11, 1971. A copy is attached.

The Moderator recalled that there was difficulty in communicating with the Coordinating Committee regarding flood protection measures. He felt that there was still residual uncertainty on CRC's part regarding the Coordinating Committee's use of the Standard Project Flood (SPF) concept and also of the flood protection goal of controlling or protecting 25 percent of the watershed above Hartford. He felt that the Coordinating Committee tried

hard to provide clarification, but that further clarification apparently was still needed.

Mr. Gagnon felt that Mr. Ignazio of the Coordinating Committee and the U. S. Army Corps of Engineers, who had attributed opposition to out-of-Basin diversion of Connecticut River water largely to "fear and ignorance," was himself ignorant of the arguments in opposition to diversion. He recommended that Mr. Ignazio try to find out what the opponents of diversion are saying.

Mr. Gagnon differed with Mr. Stern's remark at the meeting with the Coordinating Committee that adequate funding for economic and physical modeling of the river basin would be a serious problem. He felt instead that models could be developed as long as some public agency or private organization finds these desirable.

With respect to Mr. Fisher's comments at the Coordinating Committee meeting, in reference to a meeting of conservation commissions in Springfield that he had attended, Mr. Gagnon disagreed that a purpose of the meeting had been to attack the CRC's capability. Mr. Gagnon said that the basic concern expressed at the meeting was the lack of information bearing on the ecological impact of various proposals in the Coordinating Committee report. The CRC, he said, or any future citizens committee, would be better able to assess the total impact of the report with such information. An additional concern, he noted, was the lack of communication between planners participating in the study and citizens throughout the development of the study.

## DISCUSSION OF PREPARATION OF FINAL CRC REPORT TO NERBC

The Committee agreed to the following format and schedule for its final report to NERBC:

- Letter of transmittal from CRC to the NERBC Chairman, under signatures of CRC members and Moderator. To be prepared by the Moderator.
  Deadline: January 27.

- Introduction, explaining the purposes for which the Committee was formed, the method of its organization, its functions and procedures. To be prepared by CRC staff.
  Deadline: January 27.

- Summary of findings and recommendations (excerpted from the final subcommittee reports). To be prepared by the Moderator and CRC staff. Deadline: January 27.

- Subcommittee reports. To be completed by subcommittee chairmen. Deadline: January 20.

- Dissenting/minority views. To be prepared by subcommittee members wishing to express separate views. Deadline: January 20.

- Appendixes:

    - CRC membership list. Revisions in biographical data, etc., are requested before January 27. To be prepared/modified by CRC staff. Deadline: January 27.

    - Minutes of CRC meetings. To be prepared/compiled by CRC staff. Deadline: January 27.

    - Proceedings of December 15 Scientists' Symposium. To be compiled from copies of presentations provided by the symposium participants by CRC staff. Deadline: January 27.

    - An evaluation of the use of a citizens review committee. To be prepared by Mr. Fisher and the Moderator. Deadline: January 27.

    - Recent national environmental legislation. To be compiled by CRC staff. Deadline: January 27.

It was decided that comments on the final report of January 27 would be telephoned in to the Moderator at NERBC's expense on January 28, whereupon the report, as amended, would be submitted to NERBC on February 1 and reproduced by NERBC for distribution to CRC members, for public release and for transmittal to the Water Resources Council and to the governors of the four Basin states. (Note: The need for additional meetings for public presentations of the Committee report was discussed at the close of the meeting.)

It was agreed that the final subcommittee reports would be reproduced essentially intact in the final report and that these would

constitute the bulk of the report. Only stylistic changes were anticipated. Common themes recurring in separate subcommittee reports would be summarized in the summary report. Mr. Gossland suggested that repetition and overlap could be identified by cross-referencing in the subcommittee reports.

## REVIEW OF FINAL SUBCOMMITTEE REPORTS

## SUBCOMMITTEE ON ASSUMPTIONS, PLANNING PRINCIPLES AND CRITERIA - MR. GOSSLAND

### Population growth, economic development and environmental quality

Mr. Gossland referred the Committee to a typewritten list of suggested amendments to the subcommittee report, entitled "Amendments to Preliminary Report by Sub-Committee on Assumptions-- CRC Meeting January 11, 1971." A copy is attached. He also distributed a new page 8 to the report, copy attached.

Mr. Wilson referred to page 5 of the "Revised Preliminary Report by the Subcommittee on Assumptions," (January 8, 1971), second paragraph, "Increased Population and Per Capita Income." He moved the insertion of his statement entitled "Proposal," as follows:

> The Citizens Review Committee urges that a top national priority be given in order to diminish the rate of the population growth.
>
> It has been stated by the Coordinating Committee that due to the large number of young adults in the population mix today that it would be impossible to control the population growth in the next ten to twenty years. It should be noted according to the study, the greatest growth in population will occur between the years 1995 and 2020. It, therefore, is felt that if there is any improvement in the situation in the next fifty year period, it is imperative to begin developing programs now to encourage a reduction in the population growth rate.
>
> We feel that this is a proper concern of the federal government. Much of the future planning and development of the Connecticut Basin aimed at improving the environment will be nullified if the population growth rate is not drastically reduced.

Mr. Brown seconded the motion. Mr. Wilson argued that the Committee ought to record its feelings on population growth since its report will be transmitted to the President and Congress

and the federal government has the capability to affect population growth. He said that more aggressive work is needed to find acceptable remedies to the problem.

Mr. Gossland pointed out that the population growth rate in the Valley is considerably less than in the rest of the United States, and in any case there is a natural tendency toward a declining birth rate. Even so, he noted that with declining population growth rates in the Valley projections contained in the Coordinating Committee report appeared statistically sound. He also felt that governmental restraints on population growth were out of place, and that the real issue is population distribution.

Mr. Graf thought that perhaps industrial and population inmigration, for example, from the New York metropolitan area, may be a greater determinant of valley population than the birth rate. Even if population growth could be contained, he felt that increasing disposable incomes would create even greater pressures on natural resources.

Mr. Stern agreed with Mr. Wilson that the subject is important, but wondered whether the CRC, some of whose members have as many as four or more children, has standing to object to continued unregulated population growth. He noted that the imposition of birth restraints would imply an agonizing view of land and water management, and would present a difficult public educational task. Furthermore, he questioned whether the Committee would enhance its credibility if it took on the global/national question of population control.

Mr. Lee referred to the paragraph on page 5 of the revised preliminary subcommittee report entitled "The timely availability of water in sufficient quantity and quality to support the projected economy." He suggested that the Committee's position that high priority be given to the Coordinating Committee's recommendations on economic development should not preclude favoring reasonable limits on economic growth such as population control. He proposed that Mr. Wilson and Mr. Gossland together amend Mr. Wilson's statement and insert it in the report as a qualification of the Committee's position favoring high priority for economic development projects. The Moderator requested that Mr. Gossland and Mr. Wilson revise the subcommittee report accordingly.

At the close of the meeting, Mr. Gossland suggested that in place of recommending national controls over population growth the Committee could appropriately express its concern by treating the issue within the recommendation of the Assumptions sub-committee (pp. 3-4 of the revised preliminary report) that an effective methodology be established nationally for weighting the four planning criteria proposed by the Water Resources Council.

SUBCOMMITTEE ON POWER - PROFESSOR HIGGINS

Professor Higgins referred the Committee to a typewritten list of suggested amendments to the subcommittee report, entitled "Proposed revisions for the subcommittee report on power for the Citizens Review Committee." A copy is attached.

Minimum flow requirement

Mr. Brown commented with regard to the proposed revision of page 5 of the subcommittee report, "conclusion 2," that the question of low flow augmentation as it relates to power is more precisely a question of passage or release of augmented flow. He therefore suggested revising the new "conclusion 2," which states that "the subcommittee also endorses other realistic augmentation," to read "the subcommittee also endorses required release of any added augmentation." He suggested further that the subcommittee report recommend appropriate management of low flow augmentation to include monitoring of river flow and evaluation of the effectiveness of releases of augmented flow, to insure compliance with augmented low flow releasing requirements. Professor Higgins accepted both points.

Mrs. Quinn questioned whether, in light of the discussion with the Coordinating Committee the preceding Monday, the subcommittee ought to recommend that a minimum flow, or minimum release of low flow augmentation, of .2csm ought to be made a prerequisite to relicensing of all power dams on the main stem and the tributaries. She wondered whether the subcommittee might then, in light of the impact of such a requirement on power impoundments, balance that impact against potential benefits to the Basin and call for consideration of alternative means of supplying peak power.

Mr. Fisher argued that in light of the discussion Monday the subcommittee ought not to recommend uniform application of the .2csm minimum flow requirement throughout the Basin, but should recommend restricting its application to four specific dams up for relicensing. The subcommittee, he said, should then urge early attention to the question of minimum flow at other main stem tributary dams in further planning.

Mr. Stern felt that the Committee could recommend application of .2csm minimum flow to all dams, since the wording of licenses administered by the Federal Power Commission-- as in the case of the Holyoke dam-- is such that the Federal Power

Commission can specify that augmented low flow releases should be made through dams not up for relicensing. However, he urged the Committee to take note of the cost of uniform application of minimum flow requirements, which would occasion a loss of hydro power capacity and a corresponding need for additional internal combustion or nuclear generating equipment. The Federal Power Commission, he said, would have to determine the cost. Professor Higgins further pointed out that the cost would be charged to power consumers.

Professor Higgins accepted Mrs. Brown's suggestion that Holyoke dam be specially mentioned in the subcommittee's recommendations concerning minimum flow.

Mr. Graf noted that fossil fuel power generating plants are not an economic replacement for a spinning reserve on conventional hydro and pumped storage plants.

Mr. Brett thought that the amount of air pollution resulting from increased nuclear and internal combustion generating facilities, if the .2csm minimum flow requirement were uniformly applied, would be small, since the amount of power generating capacity that would have to be replaced must be small. As an ecologist, he objected to low flow augmentation in principle.

Pre-construction environmental impact evaluations

Mr. Brown suggested that the Power Subcommittee recommend that power plant construction be subject to state pre-construction permits for discharging into waterways that might require evaluations of environmental impact. He noted that these were recommendations of the report by H. Zinder & Associates, Inc., for the New England Regional Commission, A Study of the Electric Power Situation in New England 1970-1990 (September, 1970).

Mr. Gagnon expressed disappointment that the Power Subcommittee had not alluded to the serious environmental uncertainties that attend the construction and operation of nuclear generating plants, in spite of what he termed the Atomic Energy Commission's propaganda. He stated that it was unclear to him whether private companies of any kind must submit environmental impact reports prior to project licensing, construction and relicensing. He therefore suggested that the Power subcommittee

state that environmental impact reports, prepared and submitted by private companies as well as government agencies, prior to project licensing, implementation and relicensing, are essential. Mr. Gagnon accepted Mrs. Brown's offer to extend a comparable recommendation of the Subcommittee on Priorities and Implementation to private companies, depending on its wording. The Moderator asked for an explicit statement from Mr. Gagnon for Mrs. Brown's use in modifying the report of the Subcommittee on Priorities and Implementation and observed that the proposed recommendation is a common element in several of the subcommittee reports and that it would not be weakened by repetition.

Mr. Gossland noted that the National Environmental Policy Act of 1969 does not differentiate between public and private hydropower structures in its requirement that major federal actions significantly affecting the quality of the environment be preceded by an evaluation of their environmental impact. (Note: major federal actions significantly affecting the environment, under section 102(C) of the act, would include federal licensing actions, for example, by the Federal Power Commission.)

Mr. Gagnon stated that the report of the Power Subcommittee is inconsistent with the other subcommittee reports in that it approves of the Coordinating Committee's environmental evaluation of the power element, whereas the position of other subcommittees is that the Coordinating Committee has produced insufficient information upon which to assess the environmental impact of major recommendations. He said it was necessary to eliminate such inconsistencies if a final report was to be produced for the Committee as a whole. The Moderator requested that Mr. Gagnon put his suggested amendment in writing for Professor Higgins' execution and use.

Separability of the power element

Mr. Fisher noted that at a recent meeting of Conservation Commissions in Springfield, it had been charged that when the $700 million estimated cost of the power element is subtracted from the total $1.8 billion cost of the Early Action Program. The remainder still provides for a large number of impoundment structures. He disagreed, and wondered whether this mistaken impression is widespread. He argued to the contrary, that the subcommittee report should reflect that future power development contemplated in the Early Action Program is relatively separable from other Early Action Program development proposals. That is,

no other development proposal, including upstream dams, would be affected by further power development.

Mr. Gagnon thought Mr. Fisher misconstrued what was said at the Springfield meeting in regard to the $700 million power element cost.

The Moderator urged Mr. Gagnon, Mr. Fisher and Mr. Higgins to make Mr. Fisher's point explicit in the subcommittee report.

Economic efficiency of nuclear plants

Mr. Lee questioned the economic efficiency of nuclear power plants. He said that since nuclear plants must operate continuously, on a 24-hour-a-day basis, to pay off, they apparently can fulfill demand economically only if they are utilized for pumping water into pumped storage during night time off hours. He wondered if this wasn't a case of robbing Peter to pay Paul, and asked what is the advantage of this marriage between nuclear and pumped storage generating capacity.

Mr. Cadwell pointed out that high investment cost and low fuel cost characterize nuclear power generating economics. Pumped storage, he said, is characterized by reliable, quick peaking capacity. For example, if the Northfield pumped storage plant had been in operation in November, 1965, it would have avoided the great Northeast blackout. He argued that it is hard to simplify the pumped storage rationale by saying it is necessary only to enable nuclear plants to run around the clock.

Importation of power

Mr. Brown argued against pinpointing any additional power production in the Valley at this time, because power needs must be considered regionally for all of New England and it would be inconsistent with that view to comment on whether Valley power needs should or could be met by Valley generated power.

Mr. Lee wondered whether the possibility that power could be imported into the Valley, for example, from Canada, might make it unnecessary to express preferences for pumped storage or other types of power detrimental to the Valley environment.

Mrs. Carver and Mr. Graf argued in favor of a regional approach to power needs, that would not unfairly burden other parts of the region with environmental costs of power production. Mr. Graf noted that the Coordinating Committee report predicted that eventually the Valley will import power, although it has traditionally been a power exporter. Mr. Gossland referred the Committee to the second element of the Coordinating Committee report summary (blue pages), which states that by 2020 thirty-three percent of the Basin's power needs will have to be imported.

Mr. Gagnon suggested that the subcommittee report recommend that all power produced in the Basin be consumed in the Basin. The Moderator and Mr. Cadwell said that this was a recommendation of the Coordinating Committee report. Mr. Higgins asked for comments in writing, from visitors as well as from the Committee.

SUBCOMMITTEE ON WATER SUPPLY, WATER QUALITY, NAVIGATION AND FLOOD CONTROL - MRS. QUINN

Mrs. Quinn distributed an addendum to the preliminary subcommittee report to members of the Committee who had not received it at the meeting with the Coordinating Committee Monday. A copy of the addendum, numbered pp. 13-14, entitled "Conclusions," is attached.

Measurement of flood risk

Mrs. Quinn remarked that discussions with Mr. Robert Restall and Mr. Graf of NERBC had given the subcommittee a good conceptual feeling for the need for flood protection as put forth in the Coordinating Committee report. She stated that the subcommittee understood the position taken by the Coordinating Committee and expressed by Mr. Leslie of the Corps of Engineers at the meeting Monday, namely that because there could be enormous damage resulting from floods of a certain magnitude, that is reason enough that the recommended flood control structural measures should be implemented. On the other hand, she differentiated between the Coordinating Committee's concept of flood protection need and the subcommittee's concept, which would be based on the magnitude of risk as well as on the magnitude of flood damage. For unless there was further clarification of risk, the subcommittee was willing to defer public expenditures for flood protection, maintain flexibility in choosing flood protection measures, and allocate public funds to other objectives.

Mr. Graf repeated the explanation he gave Monday of the origin and meaning of the Standard Project Flood concept and the flood protection objective of protecting 25 percent of the watershed above Hartford. He stressed that the 25 percent goal was an in-house planning tool that referred to control of peak contribution of the tributaries and therefore provided a handle on the magnitude of flood control to aim at. He referred to a map in Appendix C of the report showing where tributary water comes from that contributes to peak flows on the main stem. Portions of the Basin that in the aggregate would constitute 25 percent of the watershed above Hartford would be considered "strategically located" because they would be identified as contributing peak tributary flows to the main stem. Mr. Graf traced the development of the SPF from the 1936 through the 1955 floods, noting that floods in 1949 and 1955 would have nearly equalled and possibly exceeded the SPF had the attendant storm paths varied only slightly. He further stated that the SPF was not

chosen as a matter of frequency but was a storm that could reasonably be expected to occur. He emphasized the unpredictability of weather patterns and stated that in his opinion the SPF was a conservative standard for the design of flood protection structures. He stated that flood frequency is used only to establish annual damages to determine benefit/cost analysis of alternative flood control structural measures. Estimates of storm probabilities are required because flood damages have to be allocated over a period of years and damages attributable to storms of varying frequency or probability will vary accordingly. That is, he explained that the chance of occurrence of a type or size of storm is used as a multiplier factor to determine the extent of flood damage allocated over a period of years.

NERBC analysis of risk

Mr. Fisher offered an amendment to page 10 of the preliminary subcommittee report, recommendation No. 1, last sentence, substantially as follows:

> The limited information available to the CRC indicates that existing urban centers are not or may not be protected against a severe 1936 storm or subsequent storms if these had followed different paths. A satisfactory method is needed of providing the earliest possible protection. Immediate priority should be given to a study by the New England River Basins Commission of alternative degrees of flood protection needed and alternative means of protection for these urban centers. Enough information should be developed and disseminated through such a study to permit thorough evaluation of necessary flood protection measures by those affected in the Basin. If such a study cannot be completed by July, 1973, specific steps must be taken to preserve flood protection options until choices can be made, by preserving impoundment sites and by improving local protection works.

Mr. Fisher said that he and Mr. Brown remained uncertain as to the gravity of the flood risk. Mr. Brown said that according to the Connecticut Water Resources Commission and the Greater Hartford Flood Control Commission the East Hartford dike would be topped in a 1936 flood. Since upstream flood control facilities, said to be necessary to prevent flood damage in East Hartford, had not been built, and there had been considerable urbanization in the area since 1936, East Hartford was still in

jeopardy from a repetition of the 1936 flood. Accordingly, Mr. Fisher and Mr. Brown stressed the need for additional information, not of a technical nature, that could be developed by a successor citizens organization along with more public discussion.

Mrs. Quinn accepted the amendment offered by Mr. Fisher as consistent with the subcommittee report.

Mr. Gossland questioned whether he might have been mistaken in assuming that existing upstream reservoirs and local protection works in Hampshire and Hampden Counties, Massachusetts, provided adequate protection against a 1936 flood. Mr. Cadwell cited a passage from an appendix of the report stating that the Springfield metropolitan area is diked for a 1936 flood but not for the Standard Project Flood.

Flood control priorities

Mr. Brown questioned the assumption in the flood control addendum, first sentence, next to last paragraph, page 13, that "there seems no emergency need for new large flood control impoundments." He felt that the subcommittee should give top priority to determining whether this could in fact be assumed, since otherwise people living behind flood control dikes could be lulled into a false sense of security. Mr. Fisher therefore recommended that the statement be amended to read: "Because of uncertainties concerning the need for new large flood control impoundments...." Mrs. Quinn accepted the thought behind the amendment but wished to consider the specific wording. She repeated that a primary purpose of the addendum, in response to a question raised by Mr. Cadwell, was to communicate the Committee's sense of priorities more clearly than had been done, and specifically to underline the paramount need to delay costly programs with irreversible results pending further environmental impact evaluations, a determination of acceptable risk, and other analyses. The need to develop the capability, and to organize and conduct these analyses, she said, is urgent.

Mr. Gossland moved that NERBC be urged to secure adequate funding to carry out ongoing studies and public discussion to determine the need for alternative measures for flood protection. The motion was seconded and unanimously adopted. The Moderator stated that the motion would be contained in the Committee minutes and summary report to NERBC.

Individual flood control projects

Mr. Lee summarized the findings and recommendations of a seven-page statement appended to the preliminary subcommittee report, entitled "Specific concerns on the major flood control and multi-purpose dams." He said benefit/cost tradeoffs of each project had been considered in the analysis. Local points of view were also sought. In summary, the statement opposed the Victory, Gaysville and Meadow dams. With respect to other projects, Mr. Lee stated that the subcommittee was uncertain what to recommend because of doubt that there had been the same exhaustive, or in any case adequate, public and private research that had accompanied plans for the three foregoing projects. Mrs. Quinn added that members of the subcommittee felt strongly that they lacked the necessary information to make judgments concerning individual flood control structural measures. Mr. Lee asked for Committee guidance on whether the subcommittee ought to favor or oppose the remaining projects, as follows:

Bethlehem Junction dam -- delay until it can be determined that the project is still necessary provided other priorities expressed in the subcommittee report are fulfilled;

Claremont dam -- postpone to long-range 2020 plan, for equivalent reasons;

Beaver Brook dam -- support as a conservation measure with strong public support;

Honey Hill dam -- restudy for alternative solutions;

Cold Brook dam -- delay until compatibility with Glastonbury's goals canbeestablished. Mr. Lee accepted Mrs. Brown's request that the second sentence in the next to last paragraph on page 6 of the statement be deleted; namely, "It is felt that the Cold Brook Reservoir would badly upset goals (of individuals and organizations in the Glastonbury area)."

Blackledge dam -- no position;

Tully dam -- request study of ecological/social/economic effects of diversion on the area; questionable water quality benefits on Millers River;

Gardner dam -- give priority to water quality measures.

Mr. Lee stated that the subcommittee's positions on individual projects had been modified by Mr. Fisher's amendment, to the effect that projects identified should be deferred with their sites protected pending completion by no later than July, 1973, of an analysis by NERBC demonstrating their need as alternative flood protection measures for existing urban centers.

Mr. Wilson felt that there was no value in the time spent by the Committee if it could not take a position for or against the dams. He felt that proposals to delay projects for further study were fence-sitting. Mr. Gagnon argued that recommending project deferrals for lack of specific information is a legitimate position. He moved that the Committee accept the subcommittee's specific recommendations on the proposed dams, as modified by Mr. Fisher's motion that objectionable dams be deferred pending further analyses by NERBC. The motion carried, subject to the following modifications of the subcommittee's recommendations:

> The subcommittee took no position on the Blackledge and Cold Brook dams, on a motion by Mr. Fisher, seconded by Mr. Brown, and adopted by the Committee, Mr. Lee and Mr. Brett dissenting. Mr. Fisher noted that neither dam had a water supply, water quality, commercial navigation or flood control justification in the Coordinating Committee report, and therefore neither was within the scope of the subcommittee report; moreover, they are covered in the report of the subcommittee on recreation. Mr. Brown further emphasized the purely local impacts of these projects where, he felt, the Committee would be out of place in taking a position. Mr. Gagnon and Mr. Lee argued, however, that the Committee's charge was to consider the basinwide impacts of all projects taken together. Mr. Brown explained that he would object to the Committee's taking a position regarding an individual project with purely local or state impact, but would not otherwise object to the Committee's commenting upon it.
>
> The subcommittee recommended that planning for the Bethlehem Junction dam be continued, provided that there be citizens' involvement, at the suggestion prior to the meeting by Mr. Wilson, accepted by Mrs. Quinn and the subcommittee.

Mr. Lee and Mr. Brett stated that they would prepare a dissenting view opposing the Victory, Gaysville and Meadow dams, essentially on the grounds that exhaustive studies have shown to their satisfaction that the environmental costs of these projects would outweigh all other combined benefits.

## SUBCOMMITTEE ON RECREATION, ANADROMOUS FISH, RESIDENT FISH, AND WILDLIFE AND SITE PRESERVATION -- MRS. CARVER

Mrs. Carver summarized the findings and recommendations of the subcommittee report. She said that one result of the Monday meeting with the Coordinating Committee was her uncertainty as to how the Coordinating Committee had set up benefit/cost ratios based on recreational benefits of impoundment sites assessed before project construction, and how these compared with recreational benefits assessed after construction.

Mr. Wilson proposed that the first recommendation of the subcommittee on page one of its report be amended by deleting "full" and rewording the remainder of the sentence to read, "implementation of the National Recreation Area as proposed by a combination of federal, state and local action and as recommended by the Coordinating Committee, with the advice and consent of officially established local advisory committees." Mrs. Carver accepted Mr. Wilson's rewording and added specific reference to the appointment of an official advisory group for the Coos unit.

Mr. Fisher proposed that recommendation nine on page three of the subcommittee report be amended by deleting the second sentence and inserting specific reference to the application of the .2csm minimum flow requirement to the Holyoke dam at an early date without waiting for the expiration of its license and to any future main stem dam. He suggested that the recommendation be reworded to recommend early study of the application of the .2csm minimum flow requirement to existing main stem power dams and of the question of what minimum flow requirement should apply to tributary dams, specifically to the proposed Enfield dam. Mrs. Carver accepted the amendment.

## SUBCOMMITTEE ON UPSTREAM WATER AND RELATED LAND RESOURCE POTENTIAL -- MRS. DEITRICK

Mr. Cadwell referred to page three of the subcommittee report concerning low flow augmentation that could be produced by the 118 upstream water impoundments recommended by the Co-ordinating Committee. He said that the Corps of Engineers had estimated that these impoundments in the aggregate could produce 600 cfs low flow augmentation in the tributaries. This was a staggering figure, and he wondered what flow augmentation effect this might have on the main stem. Mr. Graf explained that the effect on the tributaries would be tremendous, but the release of augmented flow from different tributaries at different times, where the nature of the soils and terrain varies, would probably not produce a desired effect on the main stem, at the time required, for water quality or other purposes.

Mr. Wilson felt that the second paragraph in the report, regarding the lack of "sufficient information to make quantitative judgments on specific proposals," is the key finding of the subcommittee, and suggested that this be related to the Committee's recommendations concerning the establishment and functions of a NERBC Connecticut River Basin Program.

Mr. Lee felt that "quantitative" judgments ought to be "qualitative" judgments. The Moderator and Mr. Stern suggested deletion of "quantitative". (Note: Mrs. Deitrick was absent but accepted the suggestion by telephone following the meeting.)

## SUBCOMMITTEE ON PRIORITIES AND IMPLEMENTATION -- MR. ROUNER

Mrs. Brown spoke for the subcommittee in Mr. Rouner's absence. Mrs. Brown said that the subcommittee felt that the other subcommittees should establish priorities, and therefore priorities 1-4 listed in the report of the subcommittee on Priorities and Implementation either ought to be expanded to include all of their stated priorities or ought to be deleted. Mr. Fisher felt that priorities 1-4 belonged in the summary report rather than in the subcommittee report where they were too repetitious. The Committee accepted Mrs. Brown's suggestion that priorities 1-4 in the subcommittee report be deleted and that the subcommittee be renamed the Subcommittee on Implementation.

### Environmental impact evaluations

Mr. Stern referred to priority item 6: "environmental studies. To ensure minimum detrimental impact on the environment, comprehensive ecological evaluations should be made of all proposed projects." He stated that power projects are reasonably well covered by existing power law, and wondered whether the subcommittee intended for the recommendation to apply to other types of development such as housing, marinas, etc. Mr. Graf mentioned that under new Vermont legislation such developments having an environmental impact require state permits; he suggested that the recommendation make reference to the Vermont legislation. The Moderator asked Mr. Brett to revise the recommendation accordingly for acceptance by the subcommittee. The Moderator further emphasized that the recommendation should refer to all structural developments having an impact on the environment, and that there should be no limitation, express or implied, to power projects.

Mr. Lee stressed that environmental evaluations should be conducted by highly qualified, disinterested people rather than by agencies, like the Corps of Engineers, with vested interests in project implementation, and that evaluations should be made available for public scrutiny. He proposed that the Committee specifically recommend that the Coordinating Committee report be made subject to such a requirement, on the ground that only the Corps of Engineers will be required to submit an environmental evaluation of the Coordinating Committee report under the National Environmental Policy Act of 1969.

Mr. Gossland pointed out that environmental evaluations could be costly, and furthermore could in some instances cause irresponsible delays in project implementation in order to satisfy a relatively unimportant, academic point. He cautioned the Committee against overextending itself on this point. He wondered what additional increase to the overall Connecticut River program cost of $1.1 billion (minus the $700 million power element) would be caused by the environmental evaluation requirement. Moreover, he reminded the Committee that Congressional appropriations committees typically respond to legislation like the National Environmental Policy Act of 1969 with inadequate funding. The Moderator suggested that the question of important versus unimportant environmental evaluations could be left to the discretion of competent ecologists.

The Moderator stressed the importance of making the results of environmental evaluations available to the public prior to project approvals and construction.

Mr. Gossland urged the subcommittee to recommend adequate funding for a citizens advisory board, or citizens education commission, within the proposed Connecticut River Basin Program of NERBC. Mr. Fisher considered the CRBP an initial step only, far from enough, and said the Committee ought instead to register its serious concern with the governors and Congressional committees as to the adequacy of NERBC's overall budget. This was accepted by the Committee.

Mr. Wilson referred to item 7, which states, "The monitoring system for both flow and water quality should be expanded and constantly upgraded." He asked that it be amended to provide for the timely availability of such information to the public. Mr. Graf noted that information of this nature is currently available in periodic reports from the U. S. Geological Survey and/or from state agencies cooperating with U. S. G. S.

## DISCUSSION OF NEED FOR ADDITIONAL MEETINGS/PRESENTATIONS

Mr. Harrison asked the Committee to consider the manner in which its report would be released to the public, particularly in the Basin, and presented to NERBC. He suggested that public meetings might be arranged in approximately three key Basin communities-- Hartford, Springfield and Hanover. There would be an opportunity to present the Committee's report to NERBC at its next regularly scheduled quarterly meeting March 23. After brief discussion, the Moderator noted that the hour was late and suggested that it could be left to the discretion of the NERBC chairman to organize these presentations. He assumed that there would be full press coverage, in any case, with perhaps some television and radio coverage. (Note: NERBC has scheduled a special meeting for presentation of the Committee report to NERBC February 9 in Amherst. Details will be announced.) The Moderator explained that the NERBC chairman would arrange to distribute copies of the Committee report to the Basin state governors.

The Moderator stated that the Committee would not be dissolved until February 1, 1971, the due date for its report to NERBC.

During the discussion of the report of the Subcommittee on Water Supply, Water Quality, Flood Control and Navigation, Mr. Gagnon offered a resolve commending the Moderator for his impartiality and objectivity throughout the conduct of the review. The motion carried by acclamation.

The Moderator concluded the meeting by expressing the Committee's thanks to Mr. Graf and Mr. Harrison of NERBC for their assistance. Mr. Harrison thanked the Committee for its competent handling of its very difficult assignment.

The meeting adjourned at 5:05 p. m.

Amendments to Preliminary Report by Sub-Committee on Assumptions-
C.R.C. meeting January 11, 1971

p. 3 Replace two paragraphs beginning 'In the light ....' with:

In the light of the growing experience of CRC members with the CRBS proposals, and in the interests of continuity, it is suggested that consideration be given to including at least some of these members on the Citizen Advisory Board recommended by the sub-committee on priorities and implementation within the Connecticut River Basin Program.

It should consider reports from new groupings of sub-committees composed of residents affected by CRBS projects, directly in terms of locational proximity, and indirectly in terms of downstream benefits or other regional factors.

p. 9 Section 2. Replace text following 'only if they carry ....' with:

....pertaining to both authorization and funding only if they carry the specific endorsement of legally concerned governmental agencies, including the states.

p.10 Section 5. Replace comments:

The New England River Basin Commission (NERBC) should develop a Connecticut River Basin Program (CRBP) with a Citizens Advisory Board. It should be empowered to create sub-committees composed of residents of the basin affected by specific proposals of the CRBS either directly or indirectly, not necessarily limited to CAB members. The CAB and sub-committees should have adequate access to all the necessary technical documentation relevant to each project.

The NERBC should be authorized and adequately funded to undertake or coordinate the further studies found necessary to respond effectively to changed environmental and ecological legislation existing at the time of the implementation of any CRBS proposal, and to meet the requirements of legally concerned government agencies.

these important problems should receive funding commensurate with their needs. They also need careful coordination to insure communication of findings and utilization of results in the continuing planning and decision making process.

Respectfully submitted,

Allie J. Quinn
Chairman

Committee Members:

Richard M. Brett
Howard J. Cadwell
Joan Flood
Victor N. Gagnon
Ellsworth Grant
Peter C. Karalekas
Day Lee
Ralph Lehman
Georgie Williamson

Appendix IV - VII

# PROCEEDINGS OF CONCERNED SCIENTISTS SYMPOSIUM

December 15, 1970
Amherst, Massachusetts

15 December 1970

**Lincoln P. Brower Contribution to Symposium - Scientists' View of the Corps of Army Engineers' Connecticut River Basin Plans.**

"Biology of the annual flow cycle of the Connecticut River"

1) The Connecticut River, as is true of all natural biogeological systems, shows variation. Let's examine this variation first, and then discuss its biological importance.

[Lantern #1]

A) annual variation: moderate ($\bar{x}$ = 13,430, 1905-1968) 6,000 min. to 22,000 max., a 1:4 ratio. Other rivers in the world show much greater variation.

[Lantern #2]

B) monthly variation and the annual flood cycle:

1) Flow is low during most of year, except during spring flood season, April to June.

[Lantern #3]
Hoyt, W.G., and W.B. Langbein, 1955. Floods. Princeton University Press.
[Figure 19]

2) There is also variation in flood magnitude from year to year, but note variation between 1841 and 1950 is 12 feet to 38 feet, a factor of only 3X,! with a recurrence interval probability of the maximum of once in 300 years.

2) Major purpose of the Corps of Army Engineers' plans is to produce low flow augmentation.

A) What actually is meant by low flow augmentation?

- to capture the spring flood waters behind dams throughout the watershed, and let the water out slowly during the low flow period of the year.

[Lantern #4]

1) Kessel, Brower, and Vitousek computer analyses:

- at Montague Falls this would make possible a constant minimum flow of 13,180 with a 6-hour, 5-day-per-week flow of 15,000 cfs, i.e., the amount needed for hydrogeneration at the present Turners Falls hydro plant.

B) Why does low flow augmentation seem to be a good idea?

1) It is feasible;
2) it augments low flow, thereby
   a) flushing pollutants out of river at a constant rate;
   b) provides constant water supply to conventional hydro and thermal power plants for cooling.

3) Let's now examine the environmental cost of low flow augmentation to the river biology.

[Allee et al, Principles of Animal Ecology, p. 154.]

A) Single most important variable of riparian ecosystems is the velocity of the water flow:

- water velocity controls
  - oxygen content, therefore stagnation potential;
  - thermal properties of river
    - to which all organisms are closely adapted;
  - physical characteristics of the bottom substrate
    - silts, sands, pebbles, rocks.

- The entire native fauna and flora of the riparian ecosystems is highly adapted to the heterogeneity of the river environment which is controlled by natural variation in the flow velocity, i.e., the annual flood cycle.

[Lantern #5] Hoyt & Langbein. [Figure 14]

- In fact, the Connecticut River is a North Temperate Early Spring Flood Riparian Ecosystem.
- Consequently, the massive alteration in flow characteristics of the Connecticut River will completely alter its biological characteristics;
  - it is virtually certain that shad and salmon restoration would be made impossible by implementation of the Corps' plans.

B) What about the floodplain?

1) Flora and Fauna of Floodplains in the Connecticut River Basin are totally different from the upland mixed deciduous and coniferous forests which the river drains.

2) This Flora and Fauna is highly diverse and this diversity is dependent upon the annual flood cycle of the Connecticut River.

Why: because river flooding in floodplain

(a) alters the course of the river, thereby constantly isolating old meander channels (Oxbows) and creating new ones. These meander channels then undergo ecological succession producing a rich sequence of species through time.

[Show aerial photograph of the Northampton-Hadley floodplain.]

Oxbow's history

1) large lake connected to river,
2) gradually fills up ⟹ rich isolated ponds,
3) then become temporary ponds,
4) ultimately ⟹ riparian forest.

[Col. slides 1-3 (Hadley floodplain) Fort Meadow, Rainbow Beach, Meander channels.]

These temporary ponds are exceedingly important as:

1) protected natural resting and feeding areas for migratory and resident waterfowl;
2) later, the temporary ponds = amphibian breeding areas for vast Bufo populations,
   - the natural regulators of insect pests;
3) important flyways for many species of migratory birds besides waterfowl.

C) Under natural conditions, with the natural flooding cycle, the floodplain is kept in a constant state of flux, thereby assuring constant variety. Without flooding, the rich ecological diversity of the floodplain will die.

1) This is aesthetically valuable,
2) Biologically important,
3) But of greatest importance of all is the fact that the survival of man as a biological species depends upon maintaining diversity in ecosystems. The proposed plans of the Corps will in fact destroy (not just change) one of the prin- natural ecosystems of New England.

4) Recommendation.

As a professional ecologist, it is my judgment that the members of the Citizens' Advisory Committee should not accept the Connecticut River Basin's Report. There are simply too many unanswered questions about the environmental impact. Scientific studies must be carried out to assess the true long-term cost-benefit ratio of such plans as these.

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Note: The source of flow data upon which this presentation was made is the official record of the Connecticut River measured at Montague City, Massachusetts.

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# THE PROPOSED FLOOD CONTROL SYSTEM

# AND THE MEADOW DAM

December 30, 1970

F. C. Kaminsky
Department of Industrial Engineering
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University of Massachusetts

## THE PROPOSED FLOOD CONTROL SYSTEM AND THE MEADOW DAM

In the report of the Connecticut River Basin Coordinating Committee (CRBCC), a flood control system is proposed for the Connecticut River Basin at a cost which will exceed 280 million dollars at 1969 prices. The proposed flood control system is based on the thesis that structural measures, in the form of flood storage reservoirs, represent the most reasonable course of action that must be followed if one considers both the conditions that exist at the present time and the conditions that are projected beyond the year 1980.

The decision to propose the structural flood control system represents a policy statement for the Connecticut River Basin which will dictate the state of both the natural environment and the man-made environment that will be inherited by all future generations.

Since we can only speculate about the consequences of the the proposed course of action, it is imperative that we examine closely the functions that will be served by the proposed flood control system. This examination will help to provide a more realistic view of the future state of the Connecticut River Valley and will provide the basis for making a reasonable decision on the desirability of constructing the proposed reservoirs. Whenever possible, the projected view will be based on the report of the CRBCC, existing data, and developments in engineering analysis.

In summary, it will be argued that the report of the CRBCC does not demonstrate clearly a need to provide additional protection to the existing structures in the flood plain of the Connecticut River, and consequently, the purpose of the system is to regulate the Connecticut River so that the flood plain can be further developed. It is my personal opinion that the latter objective will create a future Connecticut River Valley that will be considered a disaster rather than a gift by future generations. During the course of the subsequent discussion, information will be provided that will lay the foundation for determining the extent to which the natural environment will be damaged as a result of implementing the proposed flood control system.

In order to understand the proposed flood control system and its consequences, it is necessary to review the decision situation that was confronted by the CRBCC and to examine the criteria that provided the basis for decision making. The need for a flood control system will be examined in the process of this discussion.

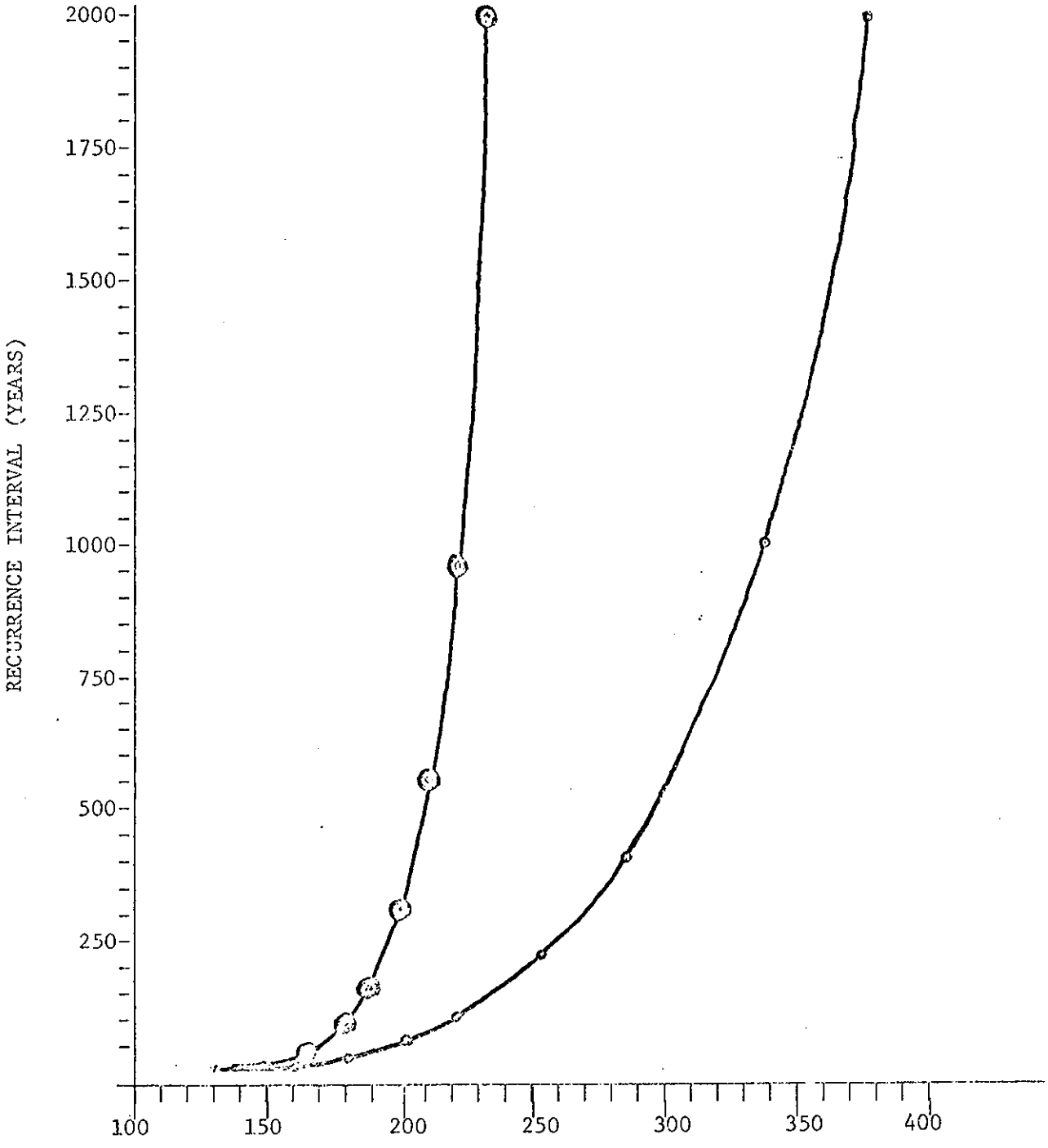
According to the report of the CRBCC, all major population centers on the Connecticut River are presently protected by a system of dikes, walls and reservoirs against a flood which is 25% greater than the damaging flood of March 1936. (See CRBCC Report page M-1-36) Some of the major population centers are protected against the occurrence of much larger floods. For example, at the Hartford Memorial Bridge, the water level would rise to a level of 37.6 ft. (msl) if the existing system of 16 flood control reservoirs were in operation and the Standard Project Flood (SPF)* occurred. At the Hartford Memorial Bridge, walls provide protection to a level of 44.9 ft. (msl) and dikes provide protection to a level of 46.0 ft (msl). Information on other locations can be found in tables C-18 and C-19 in Appendix C of the CRBCC report. From these tables, it is difficult to determine the exact level of protection which is presently available at each major population center. One must be very careful in an interpretation of the statement "All major population centers are presently protected against an occurrence of a flood which is 25% greater than the flood of March 1936." This statement does not imply that damage will be incurred at all population centers if a flood exceeding this magnitude occurs. There is a need to define more clearly the risk that is encountered at each major population center with the existing flood control system.

In order to identify the risk which is involved, it is necessary to resort to a statistical analysis of the historical record of peak flows at the particular regions of interest. For example, in Figure 1.0,

* The SPF is a flood which is 70% larger than the flood of March 1936.

FIGURE 1.0

TWO ESTIMATES OF RECURRENCE INTERVALS FOR PEAK FLOWS AT MONTAGUE CITY, MASS.



two estimates are presented for the recurrence intervals of flows which exceed a given value. In Figure 1.0 the line passing through the points denoted by circles is an estimate which was computed according to an accepted statistical method which appeared in the Transactions of the American Geophysical Union, August, 1957 by P.A.P. Moran. The line passing through the dots is the estimate given by the U. S. Army Corps of Engineers. The unusual difference between these two estimates must be examined further before any decision is reached to implement the proposed flood control system. In any event, one can conclude that a flood which is 25% larger than the flood of March 1936 is an unlikely event. According to the estimates of the Corps of Army Engineers, a flood of this magnitude would occur in the order of once in 475 years. Stated differently, the chance of a flood which is 25% larger than the flood of March 1936 is one in 475. This chance is much smaller if the other estimate is used.

It can be concluded then that all major population centers are at present protected against a flood which occurs on the average less than once in 475 years. Many of the population centers are protected against floods which have a smaller liklihood of occurrence.

The danger of over-topping the local protection works at the major population centers is only one of the reasons which gave rise to the proposed flood control system. Three other reasons exist and are worth examining. First it is argued by the CRBCC that the flood plain has been developed beyond those areas which are behind local protection works. These areas are not protected by any other means except the present system

which consists of 16 flood storage reservoirs. Flood damage figures indicate the extent of this development. The report of the CRBCC indicates that an estimated 26 million dollars damage would occur on the mainstem of the Connecticut River and its tributaries if the flood of March 1936 were to occur again with the existing flood protection system. This damage would be incurred as a result of the encroachment of the unprotected flood plain and would be allocated to the states as shown in Fig. 2.0. The proposed system of flood storage reservoirs will help to protect those individuals who have, for economic reasons, developed in the flood plain.

| State | Damage to Mainstem of Connecticut River | Damage to Tributaries of Connecticut River |
|---|---|---|
| Connecticut | 10.2 | .5 |
| Massachusetts | 2.8 | 2.9 |
| New Hampshire & Vermont | 6.5 | 3.1 |

FIGURE 2.0

Flood Damage (millions of dollars) For a Recurrence of the 1936 Flood with the Existing Flood Control System

At this point, it should be mentioned that the basic question that must be answered is: Should we provide a flood control system which will protect those interests which have expanded into the unprotected areas of the flood plain and, in the process, continue the development of the flood plain?

The question presented in this form exhibits a basic assumption that has been made. Namely, that the flood plain will be developed if adequate protection is provided. This assumption is supported by several statements in the report of the CRBCC. These statements are attached to the end of this paper. We must be concerned with the following possibility. Additional flood control structures will encourage further development of the flood plain. This additional development will generate a need for additional flood control measures, etc., etc.

A second reason presented by the CRBCC in support of additional structural flood control measures is related to a criterion which was specified in the flood damage reduction plan for the Connecticut River Basin which was approved by Congress in 1938. In this plan, an objective is stated which says that 25% of the watershed of the Connecticut River North of Hartford, Connecticut should be controlled. This objective has been adhered to by the Connecticut River Valley Flood Control Commission through the Connecticut River Flood Control Compact which was established in 1953. This objective should be discontinued as a rational objective for any flood control system for the following reasons.

1. One cannot define control in this context. Presumably if a dam exists on a river the watershed of this river is controlled.

2. The figure 25% is arbitrary and is not based on any scientific merit.

3. If control could be defined, how does one determine the specific 25% that should be controlled?

Although it appears that this objective is unreasonable for the expenditure of huge sums of money, it has been referenced as a reason

for constructing the proposed flood control system. In the report of the CRBCC, it is stated that at present 14.8% of the watershed North of Hartford is "controlled" and there is a need to control an additional 10% in order to satisfy the original objective which was specified in 1938. Approval should not be granted for a project which is based on an unreasonable objective specified in the year 1938.

A final reason for the proposed flood control system has been presented in detail in the report of the CRBCC and deals with the objective called low-flow augmentation. The environmental effects of low-flow augmentation have been examined by others and will not be repeated here. However, it should be emphasized that the achievement of this objective will be of questionable benefit to the future state of the Connecticut River Valley both from an ecological and an esthetic point of view. Aside from the ecological questions, the citizens must ask the following question:

> What would we like to see as the natural and the man-made environment of the Connecticut River Valley that we leave to future generations?

Many questions have been raised concerning the environmental damage that may result from the proposed system of flood storage reservoirs. For example, if one of the objectives is to provide total regulation of the Connecticut River, questions naturally arise about the changes that may occur in the groundwater supplies, the life in the estuaries and the life in the system of ponds and marshes that are replenished each year during the Spring freshet. In addition, questions can be asked about the environmental effects to the natural system which exists behind the dam of each flood storage reservoir. For example, an attempt must be made to provide scientific answers to the following questions.

1. Can the natural system behind a flood storage reservoir exist under conditions of periodic innundation?

2. Will the topography of the natural system behind the flood storage dam create conditions which will lead to serious erosion during the periods of rapid "drawdown" which are necessary in any effective flood storage site?

3. What environmental problems will result from the conditions that arise due to silting in flood storage reservoirs?

In order to provide reasonable answers to these questions, one must estimate the situation that will be encountered under the uncertain conditions of Spring runoff. In particular, two conditions appear to be most important. First, under various conditions that are expected during Spring runoff, it is necessary to determine the land area that will be submerged behind the flood storage dam. Second, the length of time that the land will be submerged must be estimated. The latter condition appears to be the most important factor in estimating environmental damage, and consequently, it will be discussed in detail in this section. The Meadow Dam proposed for the Deerfield River will provide the basis for this discussion. The answers to the questions that were raised can only be supplied by ecologists. The purpose of this discussion is to provide the basis from which the ecologists can draw reasonable conclusions.

Two methods can be used to estimate the length of time that water will be impounded behind the proposed Meadow Dam. One can consider the impoundment times that were realized at other existing flood storage reservoirs under various conditions of Spring runoff in the past. It could then be assumed that similar impoundment times would be encountered in the proposed structure. A second method would be to simulate the behavior of the proposed Meadow Dam under actual conditions that have

occurred in the past. Both of these methods will be discussed.

Figure 6.1 shows that flow rates that were realized at Montague City, Massachusetts during the Spring runoff conditions of March 1936. Figure 3.0 represents a simulation of the manner in which the proposed Meadow Reservoir would behave if it existed and the Spring runoff conditions of March 1936 were to occur. Figure 6.1 is important in our discussion due to the fact that the decision to close the gates on flood control dams is made from an analysis of the conditions that exist at Montague City. Note that the impoundment times are significant. It could be argued that under the uncertain conditions at the time the decision is made to impound water, an even longer period of time may be required due to the fact that impoundment would also occur during the first peak of the Spring freshet which occurred near March 12, 1936. (See Fig. 6.1) It should also be pointed out that the peaking characteristics of the Deerfield and the Connecticut River at Montague City are not exactly synchronized as stated in the report of the CRBCC. In fact, in March 1936 the Deerfield River at West Deerfield peaked approximately 24 hours before the Connecticut River at Montague City. It is also important to point out that the CRBCC states that maximum holding times would be approximately 15 days. Figure 3.0 which was supplied by the Corps of Army Engineers for the Massachusetts Division of Water Resources certainly indicates much greater estimates are in order.

Figures 4.0, 5.0, and 6.0 illustrate estimates of holding times that can be expected during recurrence of Spring runoff conditions that occurred for selected past years. The data which provided the basis for these estimates are shown in Figures 4.1, 5.1, and 6.1.

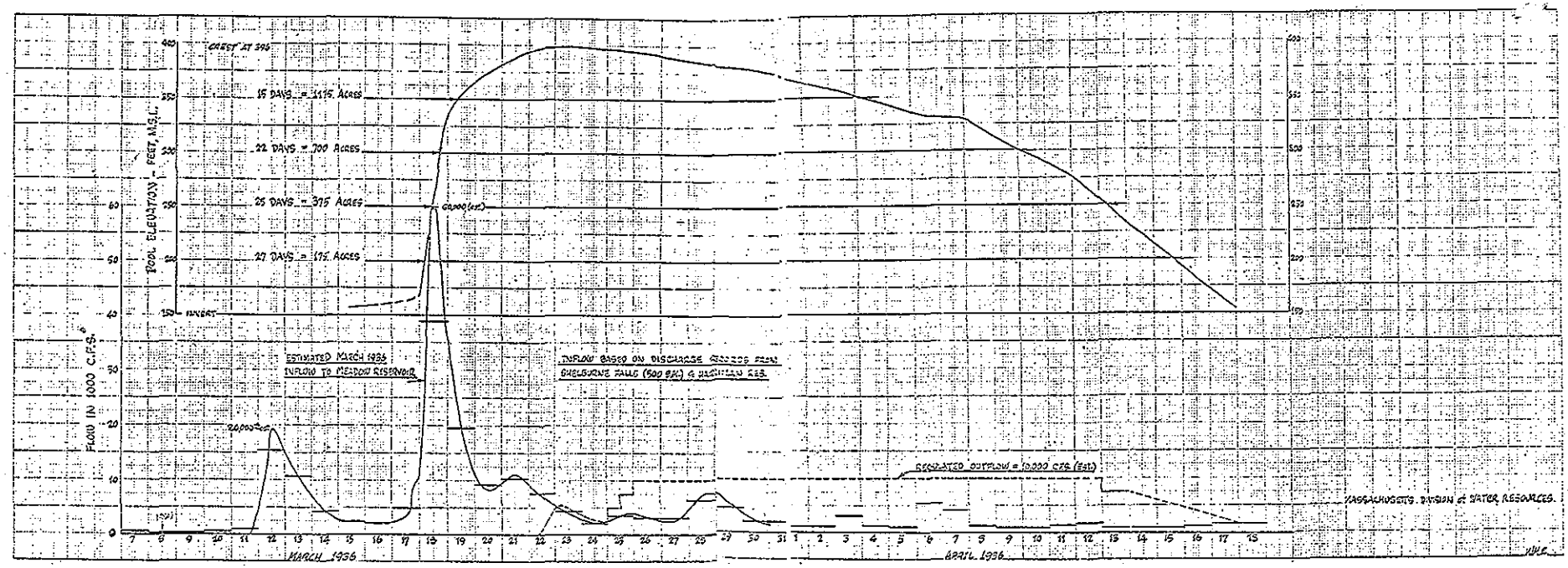

CREST AT 396
15 DAYS = 1175 ACRES
22 DAYS = 700 ACRES
25 DAYS = 375 ACRES
27 DAYS = 175 ACRES
INVERT
POOL ELEVATION - FEET, M.S.L.
FLOW IN 1000 C.F.S.
ESTIMATED MARCH 1936 INFLOW TO MEADOW RESERVOIR
INFLOW BASED ON DISCHARGE RECORDS FROM SHELBURNE FALLS (500 SQ.MI.) & DEERFIELD RES.
CALCULATED OUTFLOW = 10000 C.F.S. (EST.)
MARCH 1936
APRIL 1936
MASSACHUSETTS DIVISION OF WATER RESOURCES.

FIGURE 3.0

Figures 4.0, 5.0 and 6.0 give estimates of the length of time that the level of the Deerfield River will deviate from natural conditions due to closing the gates on the proposed Meadow Dam. These estimates represent a rough simulation of the behavior of the Meadow Reservoir for a decision rule which is based on the flow rate at Montague City, Massachusetts. This decision rule specifies that the gates on the Meadow Dam will be closed when the flow rate at Montague City reaches a specified level and will be opened, with a specified release rate, when the flow rate at Montague City returns to the level at which the gates were closed. For example, in Fig. 4.0, the holding time would be approximately 21 days if the gates on the Meadow Dam were closed when the flow rate at Montague City reaches 75,000 cfs and the net release rate when the flow returned to 75,000 cfs was 5,000 cfs.

During the Spring freshet of 1969, all 16 flood storage reservoirs were in operations for the first time. During the period of time from April 10 to early May, water was impounded at each of the flood storage reservoirs. The estimated peak natural flow rate at Montage City during this period of time is 111,000 cfs, approximately one half the peak flow that was realized in March 1936. Although the peak was much smaller than the event of March 1936, the runoff of 1969 was characterized as one with a large volume of water over a long period of time and hence significant amounts of storage were required. The main point here is that large volumes of storage are required if complete regulation of the Connecticut River is the objective. These conditions could be realized if the Meadow Dam were in operation. Significant periods of innundation could occur without waiting for major floods such as the event of March 1936.

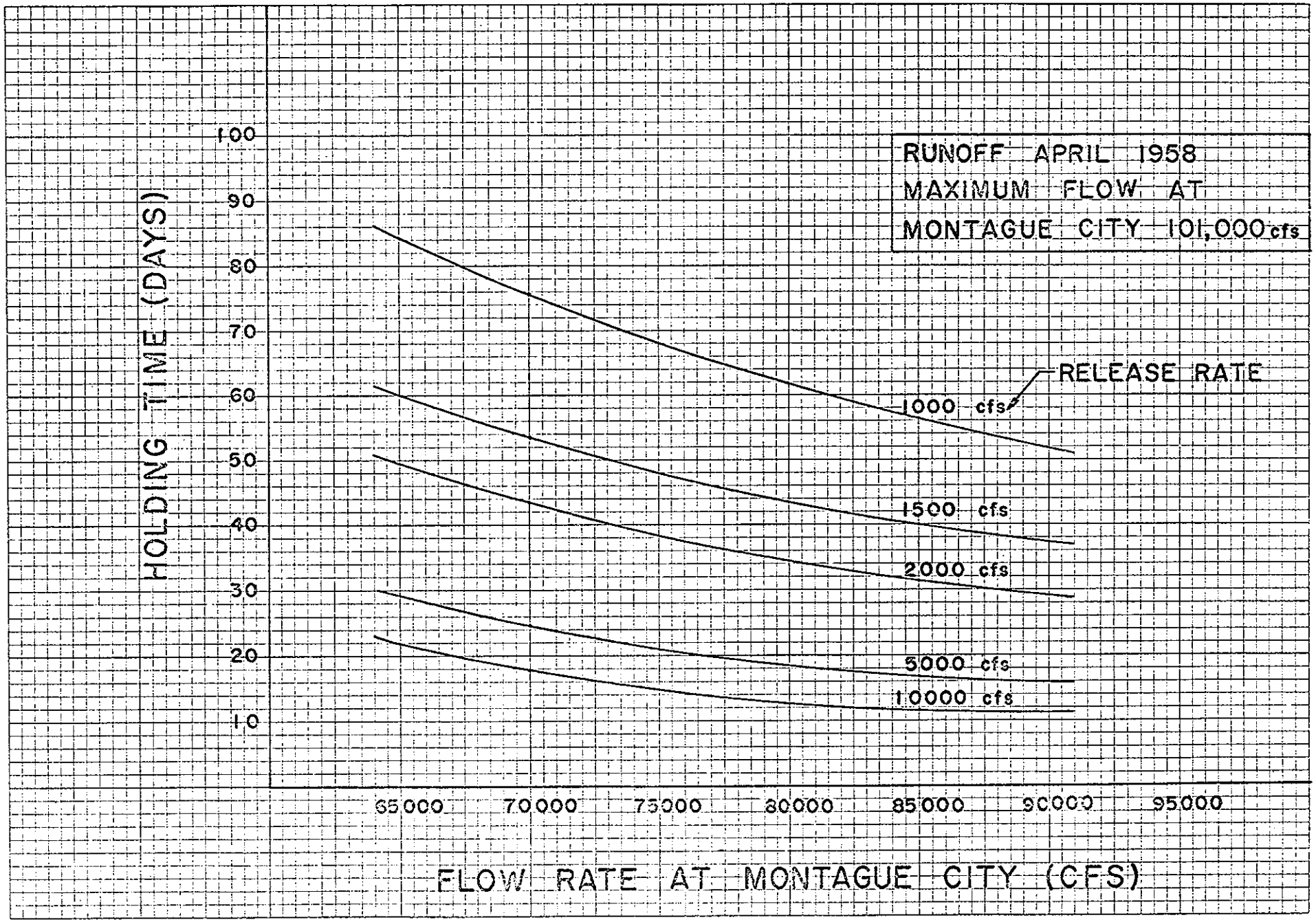



FIGURE 4.0

AVERAGE DAILY FLOW (C.F.S.)

| DATE | MONTAGUE CITY | DEERFIELD RIVER (WEST DEERFIELD) |
|---|---|---|
| April 17, 1958 | 66,300 | 6,730 |
| 18 | 80,300 | 7,750 |
| 19 | 90,200 | 7,280 |
| 20 | 90,400 | 6,200 |
| 21 | 86,000 | 6,960 |
| 22 | 89,100 | 7,280 |
| 23 | 98,500 | 7,700 |
| 24 | 97,700 | 5,240 |
| 25 | 91,100 | 3,980 |
| 26 | 83,600 | 3,120 |
| 27 | 66,000 | 2,080 |

SPRING RUNOFF DATA-APRIL 1958

FIGURE 4.1

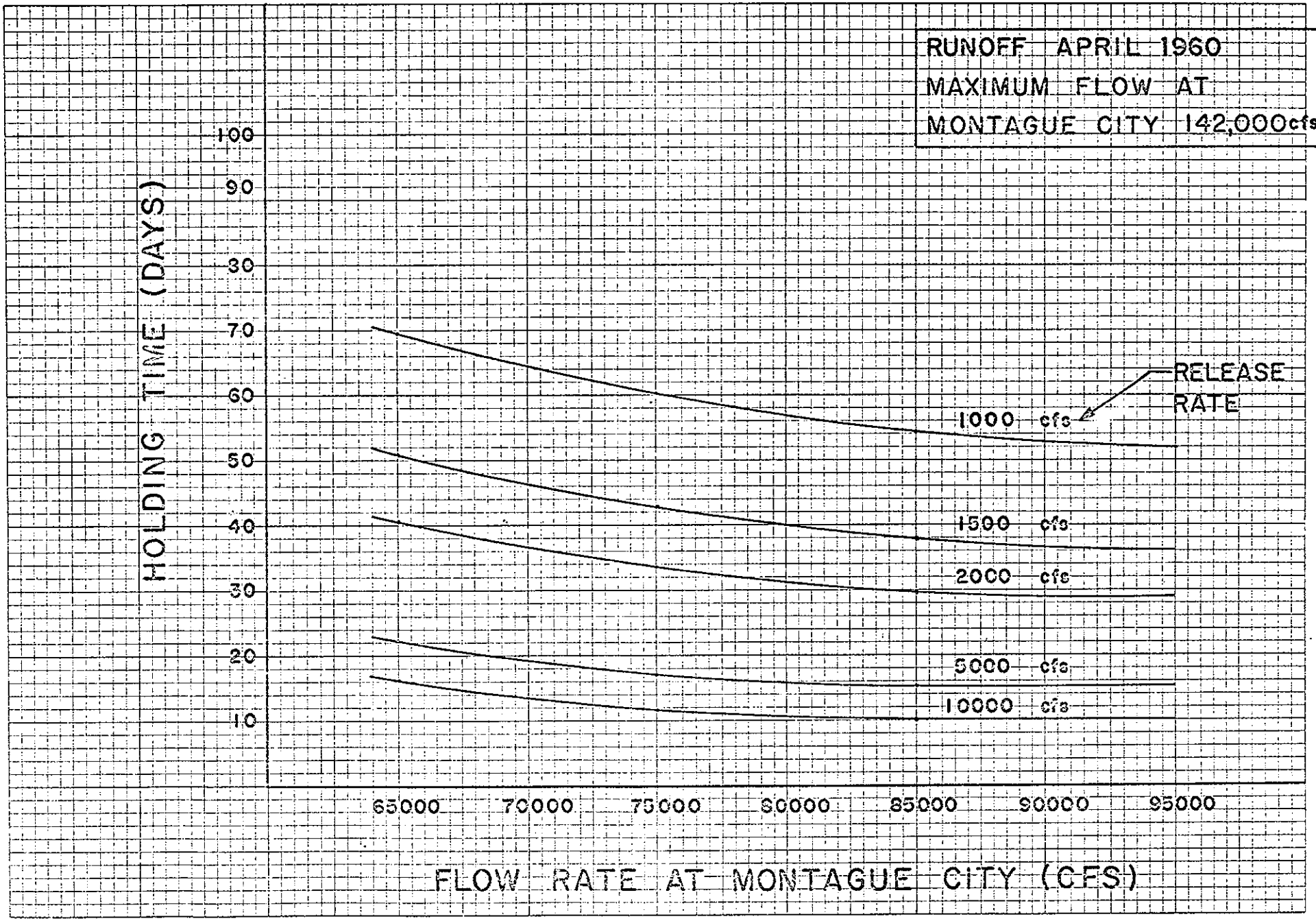

RUNOFF APRIL 1960
MAXIMUM FLOW AT
MONTAGUE CITY 142,000cfs
HOLDING TIME (DAYS)
100
90
30
70
60
50
40
30
20
10
RELEASE RATE
1000 cfs
1500 cfs
2000 cfs
5000 cfs
10000 cfs
65000
70000
75000
80000
85000
90000
95000
FLOW RATE AT MONTAGUE CITY (CFS)

FIGURE 5.0

AVERAGE DAILY FLOW (C.F.S.)

| DATE | MONTAGUE CITY | DEERFIELD RIVER (WEST DEERFIELD) |
|---|---|---|
| April 1, 1960 | 66,800 | 6,750 |
| 2 | 86,400 | 4,880 |
| 3 | 81,300 | 3,600 |
| 4 | 91,300 | 12,200 |
| 5 | 130,000 | 15,900 |
| 6 | 135,000 | 7,530 |
| 7 | 105,000 | 4,860 |
| 8 | 78,000 | 3,870 |
| 9 | 62,200 | 3,300 |
| 10 | 51,400 | 2,960 |
| 15 | 66,300 | 8,590 |
| 16 | 77,200 | 6,870 |
| 17 | 70,200 | 5,030 |
| 18 | 66,800 | 6,080 |
| 19 | 73,000 | 5,220 |
| 20 | 67,800 | 3,650 |
| 21 | 64,000 | 3,090 |
| 22 | 60,000 | 3,010 |

SPRING RUNOFF DATA-APRIL 1960

FIGURE 5.1

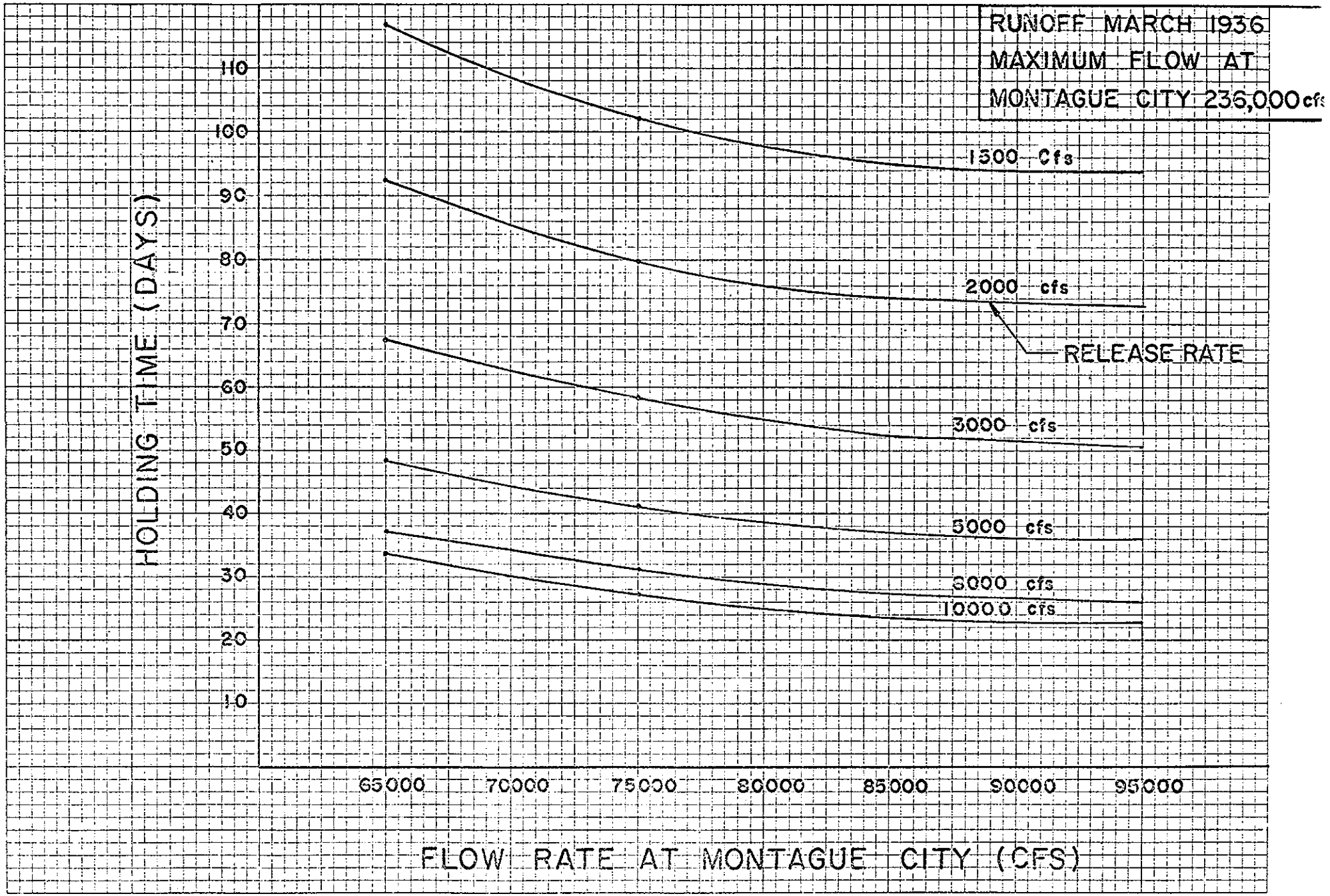



FIGURE 6.0

AVERAGE DAILY FLOW (C.F.S.)

| DATE | | MONTAGUE CITY | DEERFIELD RIVER (APPROXIMATE FLOW) |
|---|---|---|---|
| | | | 4,000 |
| March 12, 1936 | 10 P.M. 65,000 | | |
| 13 | 4 A M. 75,000 | | |
| | 10 A.M. 85,000 | INSTANTANEOUS FLOWS | |
| | 4 P.M. 95,000 | | |
| | 10 P.M. 105,000 | | 4,000 |
| 14 | | 103,000 | 4,000 |
| 15 | | 85,200 | 4,000 |
| 16 | | 70,200 | 4,000 |
| 17 | | 68,500 | 4,000 |
| 18 | | 158,000 | 30,000 |
| 19 | | 233,000 | 30,000 |
| 20 | | 216,000 | 12,000 |
| 21 | | 187,000 | 12,000 |
| 22 | | 169,000 | 10,000 |
| 23 | | 144,000 | 6,000 |
| 24 | | 112,000 | 4,000 |
| 25 | | 88,700 | 4,000 |
| 26 | | 76,000 | 4,000 |
| 27 | | 71,000 | 4,000 |
| 28 | | 70,000 | 4,000 |
| 29 | | 68,000 | 4,000 |

SPRING RUNOFF DATA-MARCH 1936

FIGURE 6.1

Figure 7.0 illustrates an estimate by the Corps of Army Engineers of the level to which the water will rise behind the Meadow Dam for various recurrence intervals. For example, it is estimated that every year the water level will reach an elevation of 275 ft. msl and will innundate 520 acres of land. This information should be of particular interest to those individuals who are familiar with the environment of the Deerfield River Valley. The Bardwells Ferry Bridge which connects the towns of Conway and Shelburne is at an elevation of approximately 240 ft, msl. According to the information presented in Figure 7.0, the Bardwells' Ferry Bridge will be 35 ft. under water each Spring and approximately once in five years it will be submerged to a depth of 90 ft. Again, if you are familiar with the topography of the Deerfield River Valley, you do not have to be an ecologist to predict that serious environmental consequences will result. In addition to the environmental costs, a question must also be raised about the effects that this degree of innundation will have on the Bardwells' Ferry Bridge. The cost of replacing this bridge, or if necessary, the cost of reinforcing the bridge is not included in the cost figures for the Meadow Reservoir. Also, it should be pointed out that the fact that the Meadow Reservoir will be used on an annual basis reinforces the argument that the ultimate objective of the proposed flood control system is to provide complete regulation of the Connecticut River.

FIGURE 7.0

MEADOW DAM AND RESERVOIR

Frequency Versus Acreage

Frequency of
Occurence

| Years | R. O. Inches | Land in Acres | Elevation |
|---|---|---|---|
| 1 | 1.5 | 520 | 275 |
| 2 | 2.0 | 680 | 295 |
| 5 | 3.5 | 980 | 330 |
| 10 | 4.5 | 1,180 | 350 |
| 20 | 5.5 | 1,380 | 365 |
| 35 | 7.0 | 1,700 | 385 |
| 50 | 8.0 | 1,900 | 396 |

SUMMARY

The proposed flood control system is recommended for construction by the CRBCC in order to provide total regulation of the Connecticut River. This degree of regulation will encourage the development of the flood plain beyond those areas which are presently protected by local protection works and, in the process, will increase the damage potential of the Connecticut River Basin. This increased damage potential will eventually provide the basis for subsequent proposals for additional storage reservoirs which will lead to further environmental damage.

RECOMMENDATIONS

1. Immediate action should be initiated to form an interstate-interdisciplinary review committee which is charged to make specific recommendations for zoning the flood plain of the Connecticut River and its tributaries. In addition, this committee should recommend a course of action to follow which will guarantee that the fertile farm lands of the Connecticut River Basin are not destroyed by uncontrolled development.
2. Immediate action should be iniated to prevent construction of flood control storage reservoirs until the flood plain of the Connecticut River has been zoned against further encroachment.
3. The proposed funds for the flood storage reservoirs should be diverted to those areas that must receive funding in order to prevent catastrophic environmental consequences, namely, water pollution control and air pollution control.

Attachment

Several statements appear in the report of the CRBCC which provide convincing testimony to anyone who states that the primary purpose of the proposed flood control system is to provide regulation of the Connecticut River so that the economic progress of the Connecticut River Basin can be enhanced (i.e., the flood plain can be further developed). These statements are repeated in this attachment for the convenience of the reader.

Main IX - 4

"When a particular national firm decides to locate in any of the smaller towns within the Connecticut Valley, the impact which such a move would have on the economy of that town or region is far more pronounced than the establishment of a body of water for recreation. Certainly, such industry is not going to locate in areas that are flood prone, or where the threat of future damages, by reason of overtopping of existing works would provide an insidious threat to their growth. Therefore, the introduction of additional flood control units would make possible the stabilization of existing operations, as well as make attractive, the introduction of new activities.

In summary, the basin plan provides incentives for the introduction of other private investments. It recognizes that such private investment would have even greater impact on the economy of the basin than does the 1980 plan."

Main VIII - 21

"Flood control measures also act to conserve the land resources of the Basin by reducing erosion and sedimentation and by making land more productive by removal of the flood hazard."

Flood Control Benefits
Main VIII - 20

"On the positive side, there is the enhancement of land use to the removal of flood potential, as well as the establishment of peace of mind and sense of security among the inhabitants of protected areas."

Appendix B Pg. B-22

"Outward pressure of the growing urban population will be felt primarily in the suburban fringe areas where land use is certain to become more intensive. Growth will also continue to occur in the flood plains and areas adjacent to them because of, in some cases, the scarcity of other suitable land available for development. The overriding factor explaining the projected growth in the flood plains, is, however, ease of development because of already existing social overhead facilities such as schools, hospitals, municipal services, highways and other accessible modes of transportation."

Main Report IV - 5

"Topography in the Connecticut River Basin has forced the urban areas of the region to cluster along the main stem of the river and its principal tributaries. Most of the readily usable land for building is in the basins flood plains or adjacent to them and it is in these areas that cities and towns which housed the main population and industrial and commercial plants which support it have grown."

Main Report V-31

"The flood plains of the basin, the rivers' natural extensions on each side of the normal watercourse, have long been the scene of man's most concentrated economic growth. Because of the ease of construction and the nearness to man's most needed and useful resource-water-the cities and towns grew fastest on the very lands nature provided to handle excess river flows, lands carved from the hills by the excess flows themselves. These lands, or those that remain largely underdeveloped, might best be zoned and managed as flood plains, allowing only those activities which would not suffer significant flood losses when innundation occurred. There is a need to prepare plans for flood plain management in those main stem and tributary reaches where the extent of existing development will not be stifled by this zoning and management.

Existing undeveloped flood plain lands often include areas of important natural resource values which are not ruined by occasional innundation. The flood storage available at these points are of value in that removal of a significant amount of such lands from this use of natural flood storage would increase the present needs for additional

artificial flood storage via reservoirs to beyond the 10% control of the drainage area above Hartford, Connecticut as expressed earlier."

"The existing natural average - annual flood losses in the Connecticut River Basin estimated at $23.5 million ($15.9 million main stem -- $7.6 million tributary) is conservatively projected to reach $25.8 million by 1980."

Main Report V-60

"Growth will continue to occur in the flood plains and areas adjacent to them because of, in some cases, the scarcity of other suitable land available for development. The overriding factor explaining the productive growth in the flood plains is, however, not the degree of upstream flood protection which some interests have stated has encourage growth in the flood plain, but rather the case of development made already possible in the way of existing overhead social facilities."

Main Report V-70

"Although the possibility of overtopping the existing protective works is remote, the consequences would result in catastrophic losses. Economic protections point to increased development contiguous to the existing urban complexes, portions of which are now protected. Current and future development is taking place because of factors and externalities other than flood control protection. In addition, there are large areas of these urban complexes which lie outside of the existing local protective works and which are not conducive to flood plain zoning

programs. Because of these factors the Coordinating Committee in its judgement has recommended that the lower portion of the basin, which represents the economic heart of the valley, should be protected to the SPF levels, and have the added degree of insurance which this level of protection provides."

Main Report VI - 7

"Elsewhere in this report, flood plain management has been noted as an alternative means of controlling flood damages. In instances where local support is lacking for protective measures of other types, this particular means should be pursued, but it is recognized that be means of storage of flows, we are, in effect, permitting a wider use of land resource by making possible the enhancement of land which would otherwise be innundated or have to lay idle for those periods when innundation would take place."

Main Report VII - 1

"It might be also that the solution in question will preserve an area for those who would rather enjoy scenery than to see additional economic progress."

# COMMENTS ON THE COMPREHENSIVE CONNECTICUT RIVER PLAN

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Geology Department
University of Massachusetts

My talk today will emphasize three points about the Connecticut River Plan as proposed by the Army Corps of Engineers: (1) significant and pertinent research was left undone in this plan; (2) viable alternate plans were not given due consideration; and (3) the assumptions regarding future development of the valley were based solely on projected population data rather than considerations of environmental quality.

When we are asked to accept a massive program that will change forever the face of the valley in which we live, we should expect a thorough investigation which explores all possible considerations and consequences, including the ecological impact of the plan and a consideration of the new flow regime of the river. I cannot understand why a more complete ecological study was not made, especially when the National Environmental Policy Act passed in 1969 directs all government agencies to evaluate their plans with regard to short-term and long-term ecological effects, as well as to evaluate all possible alternatives. The obvious reason for this law is the increasing occurrence of ecologic disasters from lack of study; for example, the New York Times discussed last week the catastrophic ecologic effects of a dam in British Columbia. Yet the Connecticut River Plan lacks a comprehensive ecological study or a really detailed discussion of alternatives that include economic and social costs.

The Corps is not candid with us about the long-range effects of the plan. Reservoir sites can be calculated to have a given life--that is, they eventually become filled in with silt and are no longer usable for flood control purposes.

But the Corps' report bypasses this problem, and one finds only a short paragraph in Volume 2 stating that the sedimentation rate is low in the river. But this is not good enough. What is the sedimentation rate of each of the reservoirs for low flow and high flow, and what are the projected sedimentation rates for the future as the valley becomes further developed? We have a right to know if and when these reservoirs will be filled and silted up, and if they are, what is the ultimate social and economic cost?

A shortcoming of the plan is that it does not study the change of the river flow regime after the reservoir sites have been completed. The base flow of the river will be raised, but the amount of silt brought into the river will be greatly reduced--the silt will be collected behind the dams. Theoretical analyses and much practical experience tell us that erosion will result--erosion that could eat into and erode away our valuable lowland areas. As a matter of fact, the Corps itself found to its dismay the serious effects of changing the flow regime of the Mississippi River. The Corps attempted to shorten the distance of the Mississippi from Cairo, Illinois, to New Orleans by building canals through the neck cut-offs of the large meanders--but that river made up its mind that it would stay the same length, and every time the Corps shortened meanders, others formed downstream. As a result of these unhappy experiences, the Corps has now in their huge Vicksburg lab a physical model of the Mississippi River, and before they make any changes on the river they observe changes on the model first. However, there is no indication in the Connecticut River Plan reports that the flow regime of the river was carefully studied or that any complete physical models of the river were constructed.

The unfortunate consequences of lowering the load/volume ratio of a river system can be observed today in the Nile River valley as the result of the Aswan Dam trapping the upstream silt. The Nile River has started a rampage of erosion

and the precious flood plains that supported the Egyptian civilization for more than 10,000 years are now being destroyed by the river.

The Egyptian civilization was able to survive and prosper because these people designed with nature. Each spring flood added nutrient-bearing silt to the flood plain--vitally needed by agriculture, while the residual flood water percolated through the soils and returned the dissolved excess nutrients to the river. The Egyptians had no massive dams to accomplish these remarkable feats--as a matter of fact, one wonders if there had been a massive program of damming the Nile in 8,000 B.C. whether there would have been an Egyptian civilization in 5,000 B.C.!

An alternative to the comprehensive plan of the Corps of Engineers is one that would take advantage of nature's method of flood control, and that is through the use of undeveloped flood plains. Only relatively small areas of flood plains are covered by massive floods of the Connecticut River. The river covered about 38 square miles of flood plains in Massachusetts during the 1936 flood (Jahns, 1947, p. 85)[1]. The flood plains as yet have not been extensively built on or developed. The method of flood control through the natural use of flood plains was recognized and glowingly praised throughout many parts of the Corps report. For example, in Volume 8 is written "The coordinating committee feels that flood plain management is vastly underrated as a tool for reducing flood damages." Again, "Flood plain management is usually the least expensive and also a comparatively non-disruptive solution. It is rapidly gaining in acceptance. Flood plain management, whether through zoning, easement, or outright purchase, recognizes the need for utilizing flood-prone areas as parks, parking areas, recreation areas, limited agricultural areas, or simply 'green

[1]Jahns, Richard H., Geologic Features of the Connecticut Valley, Massachusetts as Related to Recent Floods, Water Supply Paper 996, U. S. Government Printing Office, Washington D. C., 1947.

belts'." It is difficult to understand why this alternative method of flood control was never carefully studied with cost-benefit studies, etc. I would like to see the Corps carefully study this alternative and give us the costs of obtaining easements and of buying up the areas of the flood plains.

The way nature accommodates flood flows also has many other advantages. For example, by allowing the overflow, we create wetlands which are natural wildlife reserves. The wetlands are natural storage areas for water where a spongy organic material has the capacity to store water and slowly transmit it back to the river's base flow. This water, which slowly drains back into the river, has also been purified. Furthermore, the silt carried by the tributaries of the Connecticut, rather than being deposited behind the reservoirs, would be deposited where it should be--on the flood plains, and in time the silt will contribute to the fertility of the flood plains. In the 1936 flood, for example, Jahns (1947, p. 85) found that an average of 1-3/8 inches of silt and sand had been deposited along the flood plain areas of Massachusetts. The increased river discharges during flood flows also have the purifying effect of flushing out contaminates.

We might ask ourselves what is this $1.8 billion comprehensive project which spends more than $200 million for flood control protecting us from? Following the $66 million damage of the 1936 flood and the $48½ million damage of the 1938 flood, the Corps built floodwater controlling structures. As a result, (Vol. 8, p. M-169) if another 1936-type flood occurred tomorrow, there would be a damage of $26 million--this is the flood control program that we are protected from. Jahns (1947, p. 132) indicates that the 1936 flood is at least a 500-year flood.

If flood control alone does not seem a reasonable rationale for this program, what about water supply? Cederstrom and Hodges, in their study for the

Corps, found abundant potential supplies of ground water as yet undeveloped. These authors estimate that there are at least 1 billion gallons a day of potential ground-water supplies. This figure could be greatly increased if a system of artificial recharge by surface-water augmentation were implemented. If the Corps plan is adopted and only surface-water supplies are developed, there is a danger of losing the potential ground-water supplies for future generations. Urban development may "concrete over" the aquifers and their recharge areas, and as a result these precious ground-water resources may be lost. If we design with nature and preserve the flood plains for flood control, we can also use, develop, and preserve our ground-water resources rather than rely on temporarily enlarged surface-water supplies which may be exhausted in a few generations. Cederstrom did a fine job of evaluating the ground-water resources for the few months that he was in the field, but considering the consequences of this project, I think that a more complete inventory is needed.

In conclusion, I would urge you to send this plan back to the Corps for further work and clarification. There is too much at stake to allow the implementation of this project. In Volume I of the report, Theodore Roosevelt is quoted as sending the following message on conservation to Congress in 1907: "To waste, to destroy our natural resources, to skim and exhaust the land instead of using it so as to increase its usefulness, will result in undermining, in the days of our children, the very prosperity which we ought by right to hold down to them, amplified and developed." After reviewing and studying this report, I fear that this comprehensive project will, in the long run, result in the very evil that Theodore Roosevelt is warning us about, namely the destruction of our natural resources and the exhaustion of the land.

## Relation of Estuarine Biology to River Flow

Estuarine-tidal marsh environments are recognized as among the most productive ecosystems in the world (Shuster 1959, Odum 1959, Rankin 1961, Niering 1966, Lauff 1967) They are characterized by a mixture of salt and fresh water in a dynamic equilibrium in which a diversity of marine forms have evolved. Although a complex of interacting factors (salinity temperature, pH, currents, dissolved oxygen, and tidal fluctuations) are constantly operative, salinity is considered the most significant. A FWPCA (1968) report recommends that no change in fresh water inflow should be made that would cause permanent changes in isohaline patterns of more than ± 10% of the natural variation. Although this conservative recommendation is aimed at protecting estuaries from being degraded, ecological models verifying this 10% figure are wanting. Changes in salinity resulting from decreased fresh water inflow can drastically effect the distribution of marine organisms (Nelson 1947). A striking example is the prevention of the invasion of the oyster drill (Urosalpinx cineria) into the natural oyster beds in the upper estuary by a fresh water barrier. The interaction of salinity and temperature has also been studied by Heath where four species of fish became acclimated to fluctuating salinities (5-30 o/oo) and temperature tolerances in the higher rather than lower salinities. Dr. Sung Yen Feng at the Noank Marine Lab., Univ. of Conn. found that the hard clam (Mercenaria mercenaria) also exhibits this type of differential tolerance. These studies clearly indicate that any major modification of salinity-temperature regimes should be carefully documented in relation to the estuarine and tidal marsh biota.

In the proposed Connecticut River diversion project a 60-mile section of the river is effected from north of Hartford to Long Island Sound. Currently the environmental stresses on this river system are severe. Water quality standards for the estuary are now rated Class C. and northward to the Massachusetts State line Class D (USDI 1970). Although the estuary supports limited shellfish it is closed to shellfish harvesting due to high coliform levels. There is no question that one is dealing with an ecosystem under stress. Even though plans are underway to up grade these Class ratings, when these goals will be reached is questionable.

The unplanned ecological repercussions associated with the Aswan Dam Project are especially relevant. At the mouth of the Nile estuary the sardine fisheries have been reduced 90%. In addition, the perennial irrigation favors a certain snail which serves as an intermediate host for liver flukes which cause a serious parsitic disease--bilharzia.

Another point must also be considered. Equalizing water flow thoughout the year and eliminating periodic floods appears superficially to be advantageous. However, this implies changing the river from a catastrophic to a uniformitarian system. The more ecologists learn about natural systems the more obvious it becomes that the uniformitarian system is unnatural and the catastrophic the pattern to which organisms have evolved and adjusted ecologically. Therefore, a carefully documented analysis of the total biology of this system is essential before any such major impact is attempted. Temperature and salinity modelling along with a detailed series of other studies would be essential before one would have adequate ecological information to make a rational decision.

## Literature cited


Federal Water Pollution Control Administration. 1968. Water Quality Criteria. Report of the National Technical Advisory Committee to the Secretary of Interior. Washington, D. C.

Lauff, G. H. ed. 1967. Estuaries. AAAS Publication No. 83. Washington, D. C.

Niering, W. A. 1966. The Life of the Marsh. McGraw Hill p. 199.

Nelson, T. C. 1947. Some contributions from the land in determining conditions of life in the sea. Ecological Monographs 17:337-346.

Odum, E. P. 1959. Fundamentals of Ecology. W. B. Saunders. p. 546.

Rankin, J. S. Jr. 1961. Salt marshes as a source of food. Connecticut Arboretum Bulletin 12: 8-13.

Shuster, Carl N., Jr. 1959. A biological evaluation of the Delaware River Estuary. Information Series Publication No. 3. Univ. of Delaware, Marine Labs.

U. S. Dept. of Interior. 1970. Comprehensive Water & Related Land Resources, Connecticut River Basin. Estuary Appendix P. Federal Water Quality Administration.


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